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OF

AGRICULTURAL AND HORTICULTURAL KNOWLEDGE;

WITH AN

APPENDIX

ON SUSPENDED ANIMATION, POISONS, AND THE PRINCIPAL LAWS RELATING TO FARMING AND RURAL AFFAIRS.

SUSSEX AGRICULTURAL PRESS:
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EDITOR'S PREFACE.

In presenting this volume to the Public the Editor feels it incumbent on him, to offer a few remarks respecting the execution of his undertaking.

In the summer of 1828, he was solicited by the Publisher to superintend the revision of a work entitled "The Gleanings of Agriculture," which at the urgent request of many of his friends he was about to reprint. On the slightest view of the volume in question, it was obvious, that whilst its judicious arrangement, afforded every facility for the purpose of reference, the substance of the respective articles was in most instances obsolete, and altogether unfitted for a modern publication. Aware of his own incompetency to contribute those articles, which were strictly of an agricultural nature, he was about to relinquish the undertaking; but on receiving promises of assistance from some of the most eminent Agriculturists in the Kingdom and from many of his friends, who were more immediately connected with agricultural pursuits, than himself, he commenced his labors, with feelings somewhat " similar to those of an Architect, who having undertaken, to repair a building, within a certain period, by replacing a few unsightly or mouldering stones, finds himself, on his first operations, overwhelmed in its rubbish." In his endeavours to re-build the edifice with solid materials, the Editor has freely availed himself of the writings of others, and in many instances retained their expressions, in every case, however, due acknowledgement has been made, except where the alterations have been so considerable that they could not with propriety be attributed to their respective authors. It will be proper to acknowledge peculiar obligations, to Mr. Loudon's very meritorious publications to which the Editor feels himself highly indebted. The "Gardeners Magazine" deserves particular notice, as being one of the most useful, best conducted, and cheapest periodicals of the present day. To those personal Friends, who have kindly assisted him with their contributions, the Editor feels particularly grateful; it will be right, however, to remark, that some of the articles, furnished by persons of considerable practical experience, have at their own request, been published anonymously, whilst a few, in consequence of delay on the part of contributors themselves, were not seen by the Editor until they appeared in print, under these circumstances, therefore, he cannot be responsible for either, their language or their opinions.

EDITOR'S PREFACE.

Residing at a distance from the press, the Editor has been unable to superintend its correction, a few typographical errors have therefore, unavoidably crept in, the most important of which are noticed in the Errata at the end of the volume.

Had he not been under an engagement with the Publisher to complete the Work within a given time he flatters himself, it would have been found more worthy, the extensive Patronage bestowed upon it; in his exertions, however, to render it as extensively useful as possible, in the limited period allowed for its completion, he has endeavoured by judicious condensation and uniformity of arrangement, to embody every recent improvement and trusts no fact of importance has been omitted, or the utility of the work in the slightest degree sacrificed to the introduction of novelty;—that it is susceptible of considerable improvement no one can be more fully sensible than himself, but should the volume in its present state in any degree contribute to the advancement of the Agricultural interest of his Country, the Editor will be amply repaid for any labor or pains bestowed on its execution.

November, 3rd. 1830.

PUBLISHER'S PREFACE.

The distinguished patronage and the general support which the Publisher of the 'Library of Agricultural and Horticultural Knowledge', has experienced in its publication are such as demand his warmest gratitude.

For some years, previous, to the Work being laid before the Public, he had frequently been solicited by his friends, connected with the interests of Agriculture, to commence the undertaking; but it was not until the year 1828, that he completed his engagements with the various writers, whose experience is detailed in the present volume. Thus, aided by Men of Science and Experience, he rests assured that the Work will be found to contain a great fund of useful and interesting matter, highly valuable to those engaged in the pursuits of Agriculture and Horticulture.

The Publisher has very great pleasure, in acknowledging, the numerous favors, which his friends have so promptly and generously afforded in the shape of contributions, but, if he were allowed to single out any individual, to whom he is especially indebted, justice would oblige him to mention the name of John Ellman, Esquire. This gentleman, who stands so high in the estimation of Agriculturists and Graziers, and of all those especially, who can appreciate his labors in the improvement of the South Down Sheep; has contributed several very useful articles; and it is gratifying to the Publisher as it must be to all Mr. Ellman's friends, to remember he has not passed through life, without receiving some tribute of respect for his worth and talents. In 1800, he received a strong manifestation of the sense in which his labors were held by the presentation of a silver Cup, from twenty-seven of the nobility and principal land-owners in the county of Sussex. The goblet has engraven on it a round robin, with the names of the Donors, and within the circle is this inscription: "The undersigned, truly grateful for the great advantages rendered to the sheep breeders on the South Downs by the exertions and assiduity of Mr. John Ellman of Glynde, in making the merits of this valuable breed of sheep generally known and demanded, offer him, this Cup as a token of their esteem."

PUBLISHER'S PREFACE.

His Grace, the Duke of Bedford presented to him a silver Cup, in the year 1805, as a token of acknowledgement for the improvement of the South Down Sheep. The Board of Agriculture also, on May 14th, 1819, awarded to him the Gold Medal for the 'best cultivated Farm in Sussex.' Several Medals at various periods, have been presented to him for the exhibitions of his breed of Sheep at Smithfield.

After nearly sixty years practice as an Agriculturist, in 1829, he retired from business, followed by the praises of the Rich and the gratitude of the Poor (in whose behalf he spoke, several times, as a witness before the House of Commons). A meeting was convened in August of the same year, when the principal Agriculturists of Sussex, &c. presented to him a Silver Tureen, for which a subscription had been previously raised, signed by one hundred and eighty-one individuals, "for the zeal, he had at all times evinced, for upwards of half a century, and his readiness to come forward on every occasion, to promote the cause of Agriculture, and particularly to improve the Breed of South Down Sheep." In addition to the piece of plate, a Portrait of himself was presented to his Family, painted by Lonsdale, a copy of which accompanies this work as a Frontispiece.

In conclusion, the Publisher feels that his thanks are likewise due to the following Nobleman and Gentlemen, for their kind communications, which have been of the greatest value to the Work:

The Right Hon. the Earl of Egremont,
Sir C. M. Burrell, Bart., M.P.
H. E. Blyth, Esq.
Mr. Cameron.
J. M. Cripps, Esq.
A. Ellis, Esq.
John Ellman, Esq.
J. Epps, M. D.
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P. Skene, Esq.
Mr. Skinner.
T. H. Smith, Esq,
Mr. Stephenson.
W. Thomson, Esq.
J. W. Woollgar, Esq, F,R.S. & A.S.

The extensive support, which the Publisher has received, from his Subscribers, has induced him, in addition to binding the Work, to prepare a copious Index, accompanied with an Addenda, which will be presented, gratuitously, at a future period, and which will contain such alterations and additions, as his numerous readers may suggest.*

Trusting, the favorable auspices, under which he sends the Library of Agricultural and Horticultural Knowledge to the Reader, may be found to assist the object for which it was published, the promulgation of practical facts, he begs to

Subscribe himself,
The Public's Obedient Servant,
JOHN BAXTER.

37 High Street, Lewes,
November, 10th. 1830.

*The Publisher will feel particularly obliged, by an early transmission by Post of any suggestions or improvements on the various subjects embodied in the present volume.

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AGRICULTURAL AND HORTICULTURAL KNOWLEDGE,

&c. &c.

ACRE.

The standard measure for estimating the quantity of land: it is divided into four roods, and each rood into forty perches.

By an ordinance of the thirty-third year of Edward the First, (1304), the dimensions of an *acre* of land are curiously set forth, thus:—"When an acre containeth in length x. perches, then it shall be in breadth xvi. perches; when in length xi. perches, then in breadth xiv. perches, half a perch, and three quarters of a foot;" and so on, up to forty-five perches in length, as if land measuring was then scarcely known. The table, for such it is, thus set forth by authority, exhibits errors of calculation, which would now disgrace a school-boy.

By the Act (passed in 1824), for the equalization of weights and measures throughout the United Kingdom, which is in this respect confirmatory of the old law of England, "the rood of land shall contain 1,210 square yards, and the *acre* of land 4,840 square yards, being one hundred and sixty square perches, poles, or rods."

Other measures have, to a greater or less extent, prevailed in different parts of the country, under the same denomination of *acre*, thus:—

In Devonshire and part of Somerset, five yards (instead of five and a half) have been reckoned to a perch; in Cornwall, six yards, (anciently called the woodland perch); in Lancashire, seven yards; in Cheshire and Staffordshire, eight yards; in the Isle of Purbeck and some other parts of Devonshire, fifteen feet and one inch. In the common fields of Wiltshire and neighbouring counties, 120 statute perches, or three roods, were accounted an acre.

The Scotch acre contained 5,760 square Scotch ells, and was equal to one acre, one rood, two perches (nearly) of English measure.

The Irish acre contained 7,840 square yards, and was equal to one acre, two roods, and nineteen perches (nearly) of English measure.

The following table shews the quantity of each of the above measures equal to one hundred statute acres:—

A.	R.	P.		
120	3	20	Devonshire customary measure	Equal to one hundred statute acres.
119	2	26	Isle of Purbeck ditto	
84	0	4	Cornish, or Woodland, ditto..	
61	2	37½	Lancashire, or Irish, ditto ...	
47	1	2½	Cheshire and Staffordshire, do.	
133⅓			Wiltshire tenantry, ditto	
79	1	6½	Scotch measure	

We have seen, that the acre is derived fundamentally from the lineal yard; but in practice it is inconvenient to take the measure of ground in yards: first, because of the trouble of dividing by 4,840 to obtain the content in acres; and secondly, because sufficient accuracy could not be attained without taking account of fractional parts of a yard. To obtain therefore the content of a piece of land with the greatest facility, surveyors use a peculiar measure, (invented by Gunter two hundred years ago, and after him) called the Gunter's chain. The length is twenty-two yards, and it is divided into one hundred links of nearly eight inches each. The square of this chain is exactly the tenth part of an acre; consequently, when dimensions taken in chains and links are cast up by the rules of mensuration, the result, in square chains and links, is converted into acres by a simple division by ten.

To enter fully into the details of land measuring, would far exceed the limits of this work. A few directions will, however, be given, by which the farmer may be enabled to ascertain the content of separate fields, to mark off portions for distinct crops, or to apportion the wages of labour according to the quantity of ground operated upon.

The most simple form of a piece of land for measurement is the rectangular or oblong, contained within four straight sides, and square at all the angles. The content is found by multiplying the length by the breadth, both taken in chains and links, then cutting off five figures on the right hand, the remaining figures express the acres. The five figures cut off are so many 100,000ths of an acre, to reduce which to roods and perches, multiply by four and afterwards by forty, cutting off five figures after each multiplication. The example in the margin, whereby it appears that a piece of ground, seventeen chains fifty links long, and one chain sixty-five links broad, contains two acres, three roods, twenty-two perches, will sufficiently explain this process.

```
   17.50
    1.65
--------
    8750
  10500
  175
--------
2,88750
      4
--------
3,55000
     40
--------
22,00000
```

The next form to be considered is the triangular. Half the product of the longest side, multiplied by the perpendicular, or shortest distance between that side and the opposite angle, gives the content.

Another form of frequent occurrence in surveying, is the trapezoid, a figure of four sides, of which only two are parallel. The content is found by adding together the two parallel sides, multiplying the sum by the perpendicular or shortest distance between those sides, and taking half the product.

Every field, whose boundaries consist of straight lines, however numerous, may be divided into triangles or trapezoids, or a combination of both; and the content of each portion ascertained separately. The method of determining curved surfaces is too complex to be entered upon here; it may, however, be remarked, that where the boundaries of a field are not very much curved, imaginary

straight lines may be substituted for them, drawn so as to take in small portions in some places, and leave out equal portions at others.

Should it be necessary to take dimensions in yards, or common paces, instead of chains, the content will be most readily found by "a Table for reducing square yards into acres, roods, and perches," prefixed to "Baxter's Farmers' Account Book."

As it is frequently necessary for a farmer to ascertain how much in breadth, to a given length, will make an acre, the two following tables are presented for that purpose. In the first, the dimensions are given in chains and links; in the second, they are stated in yards, feet, and inches.

Use of the tables:—First, find the length of the piece in the table, and opposite to it stands the width required for an acre corresponding to that length. Thus, in Table I. if the length be 13 chains, 60 links, then against it is 73 links, 4 inches; or in Table II. if the length be 278 yards, then against it is 17 yards, 1 foot, 3 inches—the width to make an acre.

The width for two, three, or more acres, may be found by doubling, trebling, &c. the width for one acre. Also, the width for a quarter, a half, or three quarters of an acre, is found by taking a like proportion of the width for an acre.

The side of a square to contain exactly an acre is three chains, sixteen links, and a quarter,—or sixty-nine yards, one foot, eight inches and a half. The diameter of a circle of the same extent, is three chains, fifty-seven links, or seventy-eight yards, one foot, six inches:—

TABLE I.

Chains and Links in Length and Breadth to make an Acre.

Length	Breadth	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.
ch. li.	ch li.	ch. li.	ch. li.	ch. li.	li. in.	ch. li.	li. in.	ch. li.	li. in.
3 20	3 12½	6 20	1 61¼	9 20	108 6	12 20	82 0	16 40	61 0
3 25	3 08	25	60	25	108 1	25	81 5	50	60 5
3 30	3 03	30	58¾	30	107 4	30	81 2	60	60 2
3 35	2 98½	35	57½	35	107 0	35	81 0	70	59 7
3 40	2 94	40	56¼	40	106 3	40	80 5	80	59 4
3 45	2 90	45	55	45	105 6	45	80 3	90	59 1
3 50	2 86	50	53⅘	50	105 2	50	80 0	17 00	58 7
3 55	2 82	55	52⅔	55	104 6	55	79 5	10	58 4
3 60	2 78	60	51½	60	104 1	60	79 3	20	58 1
3 65	2 74	65	50⅜	65	103 5	65	79 0	30	57 6
3 70	2 70	70	1 49¼	70	103 1	70	78 6	40	57 4
3 75	2 66⅔	75	48¼	75	102 4	75	78 3	50	57 1
3 80	2 63	80	47	80	102 0	80	78 1	60	56 6
3 85	2 60	85	46	85	101 4	85	77 7	70	56 4
3 90	2 56	90	45	90	101 0	90	77 4	80	56 1
3 95	2 53	95	44	95	100 4	95	77 2	90	55 7
4 00	2 50	7 00	42⅞	10 00	100 0	13 00	76 7	18 00	55 4
4 05	2 47	05	41⅞	05	99 4	05	76 5	25	54 6
4 10	2 44	10	40⅞	10	99 0	10	76 3	50	54 0
4 15	2 41	15	39⅞	15	98 4	15	76 0	75	53 3
4 20	2 38	20	1 39	20	98 0	20	75 6	19 00	52 5
4 25	2 35	25	38	25	97 4	25	75 4	25	52 0
4 30	2 32½	30	37	30	97 1	30	75 1	50	51 2
4 35	2 30	35	36	35	96 5	35	74 7	75	50 5
4 40	2 27	40	35	40	96 1	40	74 5	20 00	50 0
4 45	2 25	45	34¼	45	95 5	45	74 3	25	49 3
4 50	2 22	50	33⅓	50	95 2	50	74 1	50	48 6
4 55	2 20	55	32½	55	94 6	55	73 6	75	48 2
4 60	2 17	60	31½	60	94 3	60	73 4	21 00	47 5
4 65	2 15	65	30¾	65	93 7	65	73 2	25	47 0
4 70	2 13	70	1 30	70	93 4	70	73 0	50	46 4
4 75	2 10½	75	29	75	93 0	75	72 6	75	46 0
4 80	2 08	80	28¼	80	92 5	80	72 4	22 00	45 4
4 85	2 06	85	27⅜	85	92 1	85	72 2	25	44 7
4 90	2 04	90	26⅝	90	91 6	90	71 7	50	44 4
4 95	2 02	95	25¾	95	91 3	95	71 5	75	44 0
5 00	2 00	8 00	25	11 00	90 7	14 00	71 3	23 00	43 4
5 05	1 98	05	24¼	05	90 4	10	70 7	25	43 0
5 10	1 96	10	23½	10	90 1	20	70 3	50	42 4
5 15	1 94	15	22⅔	15	89 5	30	69 7	75	42 1
5 20	1 92	20	1 22	20	89 2	40	69 4	24 00	41 5
5 25	1 90½	25	21¼	25	88 7	50	69 0	25	41 2
5 30	1 88⅔	30	20½	30	88 4	60	68 4	50	40 6
5 35	1 87	35	19¾	35	88 1	70	68 0	75	40 3
5 40	1 85	40	19	40	87 6	80	67 4	25 00	40 0
5 45	1 83½	45	18⅓	45	87 3	90	67 1	25	39 5
5 50	1 82	50	17⅔	50	87 0	15 00	66 5	50	39 2
5 55	1 80	55	17	55	86 5	10	66 2	75	38 7
5 60	1 78½	60	16¼	60	86 2	20	65 6	26 00	38 4
5 65	1 77	65	15⅔	65	85 7	30	65 3	25	38 1
5 70	1 75	70	1 15	70	85 4	40	64 7	50	37 6
5 75	1 74	75	14⅓	75	85 1	50	64 4	75	37 3
5 80	1 72	80	13⅔	80	84 6	60	64 1	27 00	37 0
5 85	1 71	85	13	85	84 3	70	63 5	25	36 6
5 90	1 69½	90	12⅓	90	84 0	80	63 2	50	36 3
5 95	1 68	95	11¾	95	83 5	90	62 7	75	36 0
6 00	1 66⅔	9 00	11	12 00	83 3	16 00	62 4	28 00	35 6
6 05	1 65	05	10½	05	83 0	10	62 1	25	35 3
6 10	1 64	10	10	10	82 5	20	61 6	50	35 1
6 15	1 62½	9 15	1 9¼	12 15	82 2	16 30	61 3	28 75	34 6

TABLE II.

Yards in Length and Breadth to make an Acre.

Length	Breadth			Length	Breadth.			Length	Breadth			Length	Breadth			Length	Breadth		
yds.	yds.	ft.	in.	yds.	yds.	ft.	in.	yds.	yds.	ft.	in.	yds.	yds.	ft.	in.	yds.	yds.	ft.	in.
70	69	0	5	130	37	0	9	190	25	1	6	250	19	1	1	320	15	0	5
71	68	0	7	131	36	2	11	191		1	1	251		0	11	322		0	2
72	67	0	8	[illegible]	36	2	0	192		0	8	252		0	8	324	14	2	10
73	66	0	11	133	36	1	3	193		0	3	253		0	5	326		2	7
74	65	1	3	134	36	0	5	194	24	2	11	254		0	2	328		2	4
75	64	1	8	135	35	2	7	195		2	6	255		0	0	330		2	0
76	63	2	1	136	35	1	10	196		2	1	256	18	2	9	332		1	9
77	62	2	7	137	35	1	0	197		1	9	257		2	6	[illegible]		1	6
78	62	0	2	138	35	0	3	198		1	4	258		2	4	336		1	3
79	61	0	10	139	34	2	6	199		1	0	259		2	1	338		1	0
80	60	1	6	140	34	1	9	200		0	8	260		1	11	340		0	9
81	59	2	4	141	34	1	0	201		0	3	261		1	8	342		0	6
82	59	0	1	142	34	0	4	202	23	2	11	262		1	6	344		0	3
83	58	1	0	143	33	2	7	203		2	7	263		1	3	346		0	0
84	57	1	11	144	33	1	10	204		2	3	264		1	0	348	13	2	9
85	56	2	10	145	33	1	2	205		1	10	265		0	10	350		2	6
86	56	0	11	146	33	0	6	206		1	6	266		0	8	352		2	3
87	55	1	11	147	32	2	10	207		1	2	267		0	5	354		2	1
88	55	0	0	148	32	2	2	208		0	10	268		0	3	356		1	10
89	54	1	2	149	32	1	6	209		0	6	269		0	0	358		1	7
90	53	2	4	150	32	0	10	210		0	2	270	17	2	10	360		1	4
91	53	0	7	151	32	0	2	211	22	2	10	271		2	7	362		1	2
92	52	1	10	152	31	2	7	212		2	6	272		2	5	364		0	11
93	52	0	2	153	31	1	11	213		2	3	273		2	3	[illegible]		0	9
94	51	1	6	154	31	1	4	214		1	11	274		2	0	[illegible]		0	6
95	50	2	11	155	31	0	9	215		1	7	275		1	10	370		0	3
96	50	1	3	156	31	0	1	216		1	3	276		1	8	372		0	1
97	49	2	9	157	30	2	6	217		0	11	277		1	5	374	12	2	10
98	49	1	2	158	30	1	11	218		0	8	278		1	3	376		2	8
99	48	2	8	159	30	1	4	219		0	4	279		1	1	378		2	5
100	48	1	3	160	30	0	9	220		0	0	280		0	11	380		2	3
101	47	2	10	161	30	0	3	221	21	2	9	281		0	9	[illegible]		2	1
102	47	1	5	162	29	2	8	222		2	5	282		0	6	384		1	10
103	47	0	0	163	29	2	1	223		2	2	283		0	4	386		1	8
104	46	1	6	164	29	1	7	224		1	10	284		0	2	388		1	6
105	46	0	4	165	29	1	0	225		1	7	285		0	0	390		1	3
106	45	2	0	166	29	0	6	226		1	3	286	16	2	10	392		1	1
107	45	0	9	167	29	0	0	227		1	0	287		2	8	394		0	11
108	44	2	6	168	28	2	6	228		0	9	[illegible]		2	5	396		0	8
109	44	1	3	169	28	2	0	229		0	5	289		2	3	398		0	6
110	44	0	0	170	28	1	5	230		0	2	290		2	1	400		0	4
111	43	1	10	171	28	0	11	231	20	2	11	291		1	11	405	11	2	11
112	43	0	8	172	28	0	6	232		2	8	292		1	9	410		2	5
113	42	2	6	173	28	0	0	233		2	4	293		1	7	415		2	0
114	42	1	5	174	27	2	6	234		2	1	294		1	5	420		1	7
115	42	0	4	175	27	2	0	235		1	10	295		1	3	425		1	2
116	41	2	3	176	27	1	6	236		1	7	296		1	1	430		0	10
117	41	1	2	177	27	1	1	237		1	4	297		0	11	435		0	5
118	41	0	1	178	27	0	7	238		1	1	298		0	9	440		0	0
119	40	2	1	179	27	0	2	239		0	10	299		0	7	445	10	2	8
120	40	1	0	180	26	2	8	240		0	6	300		0	5	450		2	4
121	40	0	0	181	26	2	3	241		0	3	302		0	1	455		1	11
122	39	2	1	182	26	1	10	242		0	0	304	15	2	10	460		1	7
123	39	1	1	183	26	1	5	243	19	2	10	306		2	6	465		1	3
124	39	0	1	184	26	0	11	244		2	7	308		2	2	470		0	11
125	38	2	2	185	26	0	6	245		2	4	310		1	11	475		0	7
126	38	1	3	186	26	0	1	246		2	1	312		1	7	480		0	3
127	38	0	4	187	25	2	8	247		1	10	314		1	3	485		0	0
128	37	2	6	188	25	2	3	248		1	7	316		1	0	490	9	2	8
129	37	1	7	189	25	1	10	249	19	1	4	318	15	0	8	495	9	2	4

ALDER.

1. Common Alder *(Al'nus glutinósa)*, Monœ'cia Tetrándria. Linn. and Amentàceæ Juss.

2. Berry-bearing Alder *(Rham'nus frángula)*, Pentándria Monogy'nia. Linn. and Rham'ni Juss.

Culture, &c. of the Common Alder.

Soil.

Flourishes best in low marshy situations; will not live in a chalky soil.

Propagated.

1. By seed.
2. By taking up old roots, and dividing them into several parts.

Tree.

1. The wood light and brittle.
2. The poles fit for use at sixteen or twenty years growth.
3. Grass grows well beneath its shade.

Use.

1. The bark affords a red colour; with the addition of sulphate of iron, or copperas, a black.

2. The wood is used for making pattens; clogs; rails for fencing; and chairs, which are very handsome, and of the colour of mahogany.

The knots furnish a beautiful veined wood for cabinets; and the branches make good charcoal, which is of considerable value in the manufacture of gunpowder.

3. The wood endures a long time under water, and therefore is used for pipes; and to lay under the foundations of buildings situated upon bogs; where it becomes black as ebony.

Culture, &c. of the Berry-bearing Alder.

Soil.

A wet soil and shade.

Propagated.

1. By seeds, which should be sown as soon as they are ripe, and then the plants will come up the spring following; but if they are kept out of the ground till spring, the plants will not come up till the second year.

2. By layers and cuttings, but the seedling plants are best—Grows wild in woods and wet hedges.

Tree.

The wood when young is soft and yellow; but becomes hard and light-red with age.

Use,

1. The berries, gathered before they are ripe, dye wool green; and a very beautiful green has been procured from the ripe berries.

2. The bark dyes yellow; and with iron, black.

3. Charcoal, prepared from the wood, is preferred by the makers of gunpowder

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APPLE.

Apple *(Py'rus málus)*, Icosándria Pentagy'nia. Linn.; and Rosáceæ, Juss.

1. Wild Apple or Crab.

The wild crab is the only apple indigenous to this country, and it is on this stock that most of our valuable apples have been grafted

and raised by the ingenuity of gardeners, who, by sowing the seeds and varying the soil, have so improved and multiplied the varieties of this most excellent fruit, that it is now become of great national importance, affording an agreeable and wholesome diet, in a thousand shapes, to all classes of society.

2. APPLE.

The apple tree was first introduced into England in the reign of Henry VIII. by Leonard Maschal, or Marshall, who, according to Fuller, " brought them from over sea," and planted them at Plumstead, in Sussex, a small village on the north side of the South Downs, near the Devil's Dyke. A correspondent writes " that Poynings, not *Plumstead,* is the name of the village alluded to;" which seems very probable.

Culture, &c. of the Wild Apple or Crab.

TREE.

1. Flourishes better on declivities and in shady places, than in open exposures or boggy lands.

2. Grass grows well beneath it.

USE.

1. As a stock on which to graft the better kinds of apples.
2. For hedges.
3. The bark affords a yellow dye.
4. The wood is tolerably hard, it turns very clean, and when made into cogs for wheels, obtains a polish and wears a long time.
5. Vinegar, or verjuice, is made from the expressed juice of the crab apple. See article Vinegar.

Culture, &c. of the Apple.

SOIL.

All sorts of apples may be planted in any common soil, with a free exposure, avoiding, however, very strong clayey or gravelly soils. The soil best adapted is a strong loam, with a dry bottom ; for if the bottom be wet, the trees are generally diseased and affected with canker.

PROPAGATED.

1. By seed. The kernels sown in February or March, in mild weather, the earlier the better, on clear light ground. They should be sown in beds three or four feet wide, covering them about an inch deep in earth. They will be fit to transplant the following Michaelmas, or spring, and in about five or six years fruit may be expected.

2. Apples may, however, be raised from seed in the short space of four years, by the following mode:—Sow the kernels in separate pots in November, and place them in a green-house during winter; they will vegetate in February; at Midsummer the plants should be moved into a seed bed, in rows, about fourteen inches apart. In the autumn of the following year, transplant them into a nursery, at the distance of six feet; every succeeding winter prune away all small lateral shoots, leaving the stronger laterals to the bottom, and so disposing the branches that the leaves of the upper shoots may not shade those underneath.

3. New varieties may be obtained by Mr. Knight's scientific mode, *vide* Pomona Herefordiensis. "It is necessary, (says Mr. Knight) to contrive that the two trees from which you intend to raise the new kinds, should blossom at the same time; therefore, if one is an

earlier sort than the other, it must be retarded by shading, or brought into a cooler situation, and the latest forwarded by a wall, or a sunny situation, so as to procure the blossoms at the same period."

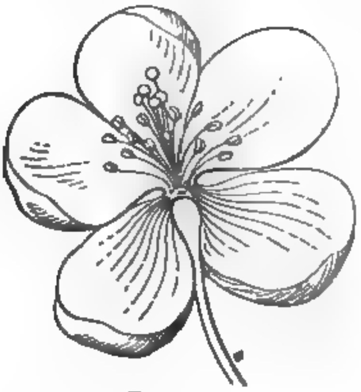


FIG. 1.

FIG. 2.

The apple blossom contains about twenty stamina or males which are represented in *fig.* 1; and generally five pointals or females, which form the centre of the cup or cavity of the blossom, as in *fig.* 3. The males stand in a circle, just within the basis of the petals or flower-leaves, and are formed of slender threads, each of which terminates in a small yellow ball, or anther, as in *fig.* 4.

FIG. 3.

FIG. 4.

As soon as the blossoms are nearly full grown, as in *fig.* 2, they must be carefully opened, and all the male stamina cut or extracted, so as not to injure the pointals or females, which will then appear as in *fig.* 3. The blossoms are then closed again as in *fig.* 2, and suffered to remain till they open spontaneously. From the blossom of the tree from which it is proposed to make the male parent of the future variety, must be taken a portion of its pollen or farina, when ready to fall from the mature anthers; and this pollen must be deposited upon the pointals of the blossoms of the tree, which is intended to bear the variety, which, consequently, will afford seed.

By shaking the blossoms over a sheet of white paper, you will ascertain when the pollen is ready. It is necessary in this experiment, to

cover the branches on which the prepared blossoms are, with a thin muslin or gauze, so as not to touch the flowers or keep off the sun or air, but to prevent the bees or other insects from inoculating them with the pollen of other blossoms, which would make the experiment uncertain; and in order to obtain the fruit and the seeds of a large size, it is best to leave but few blossoms on the tree, and, at all events, to clear the branches on which the prepared flowers are, from all other blossoms. When the fruit is quite ripe, the pips or seeds should be sown at a proper season and in suitable soil, and in about four or six years fruit may be expected. Among the new apples for which the world have to thank Mr. Knight, is the Grange apple, which fruited first in 1802, and obtained the prize of the Herefordshire Agricultural Society; it is the offspring of the orange pippin and the golden pippin. He also obtained the annual premium of the same society, in 1807, for the Siberian Harvey, an apple which fruited for the first time in that year; this tree was raised from the seed of the Yellow Siberian Crab and the pollen of the Golden Harvey. Mr. Knight also raised the Foxley apple from the seed of the Yellow Siberian Crab, and the pollen of the Orange Pippin; this fruit also received the premium in 1808, and it is said to rival the golden pippin in sweetness.

PROPAGATED by Grafting and Budding.

This may be said to be the universal practice in propagating the apple. The first consideration is the choice of stocks; of these there are five sorts in common use. *Seedling apples*, used for full standards, and riders, or wall standards; *seedling crabs* for standards and half standards; *codling apples* from layers or cuttings, for dwarfs and espaliers; *Paradise apples* or *doucins*, from layers or cuttings, for low dwarfs and trained; and *creeper apples* from layers or cuttings, for the best dwarf or bushes. Dubreuil, gardener at Rouen, recommends the doucin for clayey and light soils, and a free stock for such as are chalkey and siliceous.

1. *Stocks of Seedling Apples.*—" The seed should be selected from the fruit of vigorous growing young or middle-aged healthy trees; but when planted in large quantities, they are procured from cider makers; private propagators will adopt the first mode. The sowing and after treatment is the same as for seedling crabs.

2. *Seedling crabs.*—" A preference," Knight observes, " has generally and justly been given to apple stocks raised from the seeds of the native kind, or crab, as being more hardy and durable than those produced from the apple. The offspring of some varieties of the crab, particularly of those introduced from Siberia, vegetate much earlier in the spring than the other trees of the same species; and thence the inexperienced planter will probably be led to suppose, that such stocks will accelerate the vegetation of other varieties in the spring, and tend to produce an early maturity of the fruit in autumn; but in this he will be disappointed. The office of the stock is in every sense of the word subservient, and it only acts in obedience to the impulse it receives from the branches; the only qualities, therefore, which are wanting to form a perfect stock, are vigour and hardiness."

3. *Codling stocks* are raised chiefly from layers, which at the end of the season are taken off and planted in nursery rows, two feet between the rows, and one foot plant from plant.

4. *Paradise*, or, as they are called by the French, *doucin stocks*, are raised either from layers or suckers, and stocks from *creeping apples* (so named from their aptitude to throw up suckers), or the *Dutch Paradise*, chiefly from the latter mode. They may be planted in nursery rows, somewhat closer than the codling stocks.

5. *All stocks* require to stand in the nursery till they are from half an inch to an inch in thickness, and at the height at which they are to be grafted; such as are intended for full standards or riders, will generally require to stand three or four years before being fit for this operation; those for half standards two years, and those for dwarfs one year.

The ground between them must be kept clear of weeds, and stirred every winter; the side shoots of the plants, at least to the height at which they are intended to be grafted, should be rubbed off as they appear, and all suckers carefully removed. When budding is adopted, the stocks may be worked to nearly half the diameter of stem requisite for grafting; and stocks for dwarfs, planted in autumn or spring, may be inoculated the succeeding summer. No great advantage, however, is gained by this practice, as such plants require to stand at least another year before they have produced their bud-shoots.

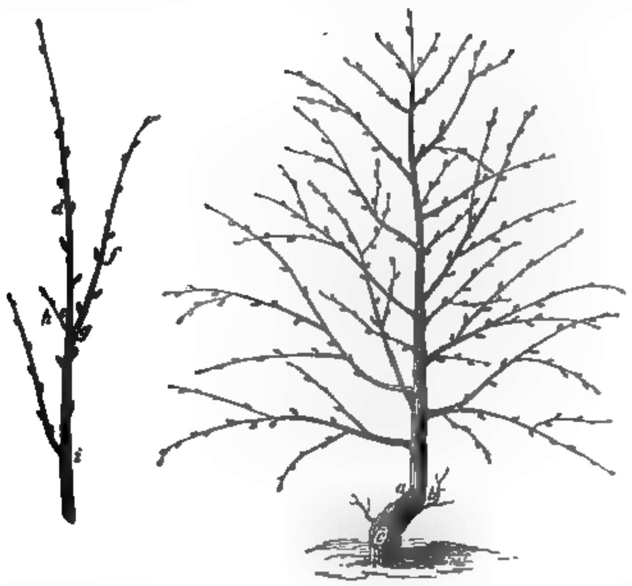
6. *Stocks destined for standard trees*, may either be grafted at the usual height at which the lateral branches are allowed to diverge, which is commonly six feet; or they may be grafted near the ground, and a single shoot trained from the graft, so as to form the stem of the tree. The propriety of grafting near the ground, or at the height of six or seven feet, will depend on the kind of fruit to be propagated, whether it be quite new and just beginning to bear, or a middle-aged variety. In new and luxuriant varieties (and these only should be propagated), it will be advantageous to graft when the stocks are three years old, as the growth of such will be more rapid, smooth, and upright, than that of the crab, and there will be no danger of these being injured by their beginning to bear too early. Middle-aged varieties will be most successfully propagated from stocks of six or seven feet high, and letting them remain ungrafted till they become firmly rooted in the places where the trees are to stand. One graft only should be inserted into each stock; for when more are used they are apt to divide when loaded with fruit, and to cleave the stock, having no natural bond or connection with each other. When the stocks are too large for a single scion, Mr. Knight recommends the grafts to be inserted in the branches, and not in the principal stem. This practice is not uncommon in various parts of England, and is very general in Germany, with free stocks, where, however, they often neglect to graft the trees; and thus, as Neile observes, produce an endless variety of sorts, some good, but most of them little better than crabs.

7. *Stocks intended to form half standards*, are grafted at three or four feet from the ground; and those for *dwarfs*, at eight or ten inches, or lower. Miller and Knight agree in recommending to graft near the ground, where lasting and vigorous trees are wanted; but the practice of the continental gardeners, and the opinions of some in this country, are in favour of leaving a stem below the graft, of not less than a foot in length."—(*Loud. Encycl. Gard.*)

8. *Apples grafted on quince stocks*, will grow luxuriantly in a soil so wet, that an apple could not live.

9. *Grafting.*—The first business is to select the scions which should be chosen from the outside lateral branches of healthy trees. At whatever season scions are to be inserted, Knight observes, "the branches which are to form them, should be taken from the parent stock during winter, and not later than the end of the preceding year; for if the buds have begun to vegetate in the smallest degree, and they begin with the increasing influence of the sun, the vigour of the shoots, during the first season, will be diminished, and the grafts will not succeed with equal certainty, though a graft of the apple tree seldom fails, unless by accidental injury, or want of skill in the operator. The amputated branches must be kept alive till wanted, by having the ends of each planted in the ground, a few inches deep, in a shady situation. For a detailed account of the various methods of grafting, see article Grafting.

10. *Grafting old apple trees*, of different sorts, with superior varieties, is an obvious and long-tried improvement. In this case, if the tree is a standard, it is only headed down to standard height; in old subjects, most commonly the branches only are cut over within a foot or two of the trunk, and then grafted in the crown or cleft manner. Apples grown on trees not grafted, are called pippins, or kernel fruit.



11. *Heading down apple trees* that are much cankered, is strongly recommended by Forsyth, who gives an example of one in the preceding engraving, after it had been headed down four years, which bore plenty of fine fruit. The point at which it was headed down (*a*) was within eighteen inches of the soil; and under it on the stump, were two large wounds, (*b*) and (*c*) made by cutting out the cankery part, and which being covered with composition, were nearly filled up with sound wood. Very little pruning is at first given to trees so cut; but afterwards a regular succession of bearing wood is kept up, by removing such as have borne for three or four years. Thus one

branch which has done bearing (*d*) is cut off, and succeeded by another (*f*), and when that is tired also, it is cut off and replaced by a third (*e*), and so on, as *h*, *g*, *i*, &c.

12. *Budding.*—This is generally performed in the month of July.—*See* article Budding.

Propagated by Cuttings.

1. " Every variety of apple may be grown from cuttings, though some with much greater facility than others; and some allege that trees so raised are not liable to canker, which is supposed to be owing to their putting out no tap-root, but spreading their numerous fibres from the knot or burr horizontally. Even the golden pippin may be continued in this way, and the trees have remained seven years in perfect health; when grafts taken not only from the same tree, but from the very branch, part of which was divided into cuttings, cankered in two or three years.

" All apple trees raised in this way," Biggs observes, " from healthy one-year-old branches, with blossom-buds upon them, will continue to go on bearing the finest fruit in a small compass, for many years." Such trees are peculiarly proper for forcing, and not liable to canker. The cuttings are to be chosen from the young wood of horizontal or oblique branches, rather than from upright ones; from six to eight inches or more in length, with a small portion of old wood at the lower end.

Cut off the tip of the shoot, and all the buds, excepting two or three next the tip or upper extremity; then smooth the sections at the lower end, and insert them three or four inches in sandy loam, pressing the earth firmly to them, watering and covering them with a hand glass. The proper time for this operation is early in February, and the glass should not be touched excepting to give water, till the shoots have sprung an inch or two. Shade during the mid-day sun, and begin to harden by giving air in July; finally, remove the glass in August, and in October transplant in nursery rows, or in pots, according to future intention. With the burknott tribe, all that is necessary is to plant the cuttings in a shady border, and treat them like those of the gooseberry or currant.—(*Loudon. Encyl. Gard.*)

Propagated by Layers.

The success cf this mode of propagation may be considered as certain. For a description of the process, see the article *Layering.*

Tree.

1. *Choice of Sorts.*—In the printed catalogues between two or three hundred varieties of the apple are enumerated; it is obvious, however, that such a list would be useless to the farmer. In the subjoined table, every attention has been paid to select those only which are likely to prove either useful or profitable.

A LIST OF APPLES

ADAPTED EITHER FOR THE ORCHARD OR GARDEN.

Name.	Bearer.	The Fruit.	When ripe.	Lasts till	Dessert or Culinary.	Character of the Tree, &c.
Baxter's Pippin	Good	Firm and Sugary	Oct.	June	D. C.	Handsome tree, fruit excellent.
Carlisle Codling	Good	Soft sub-acid	Aug.	Xmas	D. C.	Hardy tree, propagated by cuttings.
Dredge's beauty of Wilts	Great	Firm and juicy	Oct.	March	D. C.	One of the best in point of general utility.
Golden Pearmain	Good	Soft and sweet	Aug.	Oct.	D.	Hardy tree, not large.
——— Rennet	Good	Firm and juicy	Sept.	Feb.	D.	Medium sized tree, showy fruit.
——— Russet	Good	Firm and good	Oct.	May	D. C.	Spreading tree.
Hawthorndean	Great	Soft, juicy, and acid	Aug.	Jan.	C.	Very hardy tree.
Kentish Codling	Great	Soft, sugary	Aug.	Jan.	D. C.	Vigorous tree, useful fruit.
——— Pippin	Middling	Firm and sweet	Xmas	Feb.	D.	Luxuriant tree.
Kernel Rennet	Good	Firm and tender	Oct.	April	D. C.	Large, hardy, adapted for the orchard.
Loan's Pearmain	Good	Firm and sharp	Sept.	May	D.	Fruit apt to grow mealy.
Margaret Apple	Great	Tender and sweet	Aug.	Oct.	D.	Hardy tree, slender twigged.
Margil	Great	Firm and Aromatic	Nov.	March	D.	Small tree, highly-esteemed fruit.
Newtown Pippin	Good	Firm, juicy, and sweet	Oct.	May	D.	Luxuriant tree.
Nonsuch	Great	Soft and sweet	Sept.	Oct.	D. C.	Small tree; it makes a small proportion of sauce.
Norfolk Beaufin	Great	Firm and savory	Xmas	Aug.	D. C.	Hardy tree; fruit in great repute for the kitchen.
Old Golden Pippin	Middling	Firm and sweet	Oct.	Feb.	D. C.	Excellent fruit.
Oslin Pippin	V. Great	Firm and sub-acid	Oct.	Feb.	C.	Hardy dwarf; propagated by cuttings.
Ribstone Pippin	Great	Firm and highly aromatic	Nov.	March	D. C.	Free grower; one of the best apples.
Royal Pearmain	Great	Firm and sweet	Nov.	June	D. C.	Medium-sized, free growing tree.
——— Russet	Great	Firm and aromatic	Oct.	April	D.	Hardy, large tree.
Wheeler's Russet	Good	Firm and crisp	Nov.	April	D. C.	Upright and slender twigs, good fruit.
Winter Pearmain	Great	Firm, sugary	Sept.	May	D. C.	Large tree, much esteemed fruit.
Yorkshire Greening	Great	Firm and sharp	Jan.	Aug.	D. C.	Large spreading tree.

The following list of apples for *small gardens*, is recommended by Mr. Bliss:—

1. Hawthorndean.
2. Ribston Pippin.
3. Kirke's Lord Nelson, a great bearer, good for table or sauce, is in perfection in October, and will keep till spring.
4. Christy's Pippin, one of the best table apples.
5. Beauty of Kent.
6. Sykehouse, a small firm table-apple of a russet colour, and equal, from Christmas to May, to the old nonpareil. It is a great bearer.
7. Manks Codlin, one of the greatest bearers we have; fruit handsome, of a pale yellow colour. It is full of fine rich juice, and good for all purposes and is in perfection about September but will not keep long. It is further to be recommended to plant as dwarfs in the shrubbery, for its great blooming and bearing prevents its growing so large as many sorts.
8. Scarlet Nonpareil.
9. Scarlet Pearmain.
10. Hick's Fancy, a most delicious dessert apple of small size, and a very great bearer; it is in perfection about Christmas.
11. Woodstock Pippin.
12. Court of Wyck Pippin.

The following list of apples for a *small orchard*, is recommended by Mr. T. Wood, Chilwell Nurseries, (*Gardener's Magazine*, April, 1830):—

TABLE APPLES.

1. The Burgin Apple.
2. Lord Lennox.
3. Clifton (Nottingham) Nonsuch.
4. Keddlestone Pippin.
5. Wollaton Pippin.
6. Blenheim Orange, or Woodstock Pearmain.
7. Pike's Pearmain.
8. Waterloo Pippin.
9. Garret's New Golden Pippin.
10. Hertford's Russet.
11. Egglestone Summering.
12. Bess Poole, one of the best apples we have for table, baking, size, and colour; a very great bearer after the trees attain a certain age, and keeps very well.

KITCHEN APPLES.

1. Maltster Apple.
2. Manks Codlin.
3. Keswick Codlin, or Westmoreland Pippin.
4. Hawthorndean.
5. Northern Greening.
6. Normanton Wonder.
7. Greenup's Pippin.
8. Beautiful Stripe.
9. The Hunthouse.
10. Woodborough Pippin, immense bearer; very good for baking, but in its raw state has an unpleasant bitterish taste.
11. The Caldwell, or Padley's Pippin.
12. Barton Free—bearer.
13. Wareham's Russet.

Mr. Wood considers the above trees as best adapted for profit, and recommends planting six or seven of each, in preference to a greater variety.

Mr. Stevenson, of Framfield, Sussex, recommends the following varieties, as well adapted for a stiff clayey soil:—

1. Scarlet Pearmain.
2. Winter Pearmain.
3. June-eating or Jenetin.
4. Shepherd's Seedling.
5. Wadhurst Pippin.
6. Golden Russet; also Nonpareil.

All the above varieties thrive and bear well with Mr. Stevenson, whose orchard is situated on a rising hill well protected from the south, south-west and north-east winds. The soil is a stiff clay, with about twelve inches of good mould on the surface; but the pippin, broad-eyed pippin, and the codlin will not thrive upon it. In point of situation Mr. Stevenson observes:—"I would prefer a rising ground to all others. I have two orchards, the one situated upon a level surface

between two hills, the other upon a rather elevated eminence; in the latter case my crops have seldom failed me, whilst in the former they have never proved profitable: the reason I assign for this difference is, that in the spring the frosts are more severe in the lower than in the upper orchard, the tender blossoms in the former are thus destroyed, whilst in the latter they remain uninjured."

TREE.

2. In choosing trees for orchards, standards sufficiently tall as to admit horses and cattle grazing under them, should be preferred. Maiden plants, or such as are only two years old from the bud or graft, are the most certain of success.

As a general rule for distance, Nichol states, "that the ultimate space at which apple trees should stand, in a properly planted orchard, are from thirty to forty feet apart, less or more, according to the quality of the soil; taking as the medium thirty-six feet. In a poor soil and a bleak exposure, where the trees may not be expected to grow very freely, thirty feet is sufficient; whereas in a good soil, and a sheltered situation, forty may not be too much.

3. In the operation of planting, great care ought to be taken not to insert the plants deeper in the soil than they were before removal. This is a very common error in every description of tree planting, and in retentive soils is ruinous to the trees. Sir C. M. Burrell recommends as an useful practice in wet soils, or where the sub-stratum is not suited to the apple, to plant the trees on hillocks of easy ascent; as, for instance, one foot higher in the centre than the level of the field, and sloping gradually to the level for three or four feet every way from the centre. By that practice, the roots will naturally follow the good surface-earth; whereas, if they are planted in holes, the roots are apt to shoot into the prejudicial sub-soil, to the eventual injury of the plants by canker and other diseases. When trees are thus planted on small hillocks, the under-drains may pass between the rows with greater utility."

4. *Pruning.*—The best season for pruning apples is from the middle of January till the middle of March. Standard apple trees are seldom much pruned after they have attained a bearing state, except to regulate any irregularity in their branches, although there can be no doubt they would be much benefited by a more regular use of the knife. Upon this subject, Knight recommends that the points of the extreme branches should be every where kept thin and pervious to the light, so that the internal parts of the tree may not be entirely shaded by the external. The light should penetrate freely into every part of the tree; and if this be judiciously attended to, every part of it will be equally productive of fruit, and the trees thus treated will not only produce a greater quantity of fruit, but the fruit itself will be much better in quality, having the full benefit of the sun, which in crowded trees is not the case: the trees will also be able to bear a greater load, without running the risk of breaking down. Thinning the branches of old trees, and keeping them supplied with fruitful wood, encouraging young shoots to take the place of those that are getting into decay, and keeping them moderately thin, are points which ought to be strictly attended to.

In pruning dwarf standards Mr. Bliss recommends spurring, after the manner of the currant or gooseberry. "In taking your maiden tree," says Mr. B., "supposing it has only one or two shoots, it is

then necessary to cut them down to four or five buds, to get a sufficiency of wood to form the bottom of the tree; but where there is sufficient wood at the bottom of the tree, I strongly object to its being headed down according to the usual custom; for as the new wood will grow but little the first year, the shoots will swell and get strong, and if it is a good bearer will form bloom-buds all up the young shoots: this, perhaps, will alarm some to allow the tree to bear so young, but it must be remembered that the trees while young will produce the finest fruit: besides it is necessary to throw them into bearing early, to keep them from growing too luxuriantly. The tree having stood two years without being headed down, will throw out some young side shoots towards the top of the original shoots; these should be cut off within two buds of the bottom, allowing the original shoots to grow straight up, till they get to the height you wish them, say five or six feet or higher, then cut their tops off, and keep all the young shoots spurred in every year, to about two buds, nearly the same as you would a red currant tree; by this means it will throw all those spurs into bloom-buds, and I have seen by this process the trees hanging from bottom to top with apples like ropes of onions; and the trouble is no more than that of pruning currants or gooseberries."

In pruning espalier or wall trees, Abercrombie recommends in the winter pruning, that their branches be not shortened, but trained horizontally to the wall or espalier to their full length, and at the distance of about five or six inches. If there be vacancies, train in a last summer's shoot; or, if these require two or three shoots, then it may be needful to shorten a main shoot to three or four buds, to induce it to throw out young wood the summer following. In the course of this pruning, take care to preserve all natural fruit spurs; but clean out all those formed of the stumps of shortened shoots, as they only tend to produce useless wood shoots. Mr. Harrison adopts the mode of keeping only short spurs, each of which bear but once; then it is cut out, and is succeeded by an embryo bud at the base. See Mr. Harrison's invaluable "Treatise on the Management of Fruit Trees," a work which ought to be in the possession of every gardener who wishes to excel in his profession. For an account of Mr. Harrison's mode of pruning, see article Pruning.

4. Insects. *Aphis Lanigera*, *American*, or *White Bug*.—This is one of the most destructive insects which fruit trees are infested with. During winter, the insect generally disappears by creeping into any diseased rugged parts of the tree, or by descending into the ground, where it may be found feeding upon the roots. Early in spring it issues forth, increases very rapidly, and will continue its ravages until autumn, unless destroyed, when it again removes as before stated. "This insect," says Mr. Harrison, "may be destroyed by attending to the following directions:—When wall trees infested by it are pruned in autumn, all such parts as are cut off must be burned, and the nails and shreds boiled for half an hour, in soap suds and urine, in order to destroy the larvæ of insects which were deposited in them; after being dried they may be used with safety. (*Cast iron* nails are now pretty generally employed for nailing fruit trees; they are so cheap as to render their use a second time unnecessary; a slight blow from a hammer breaks them asunder, holes in the mortar from the withdrawal of the nails are completely obviated, and thus a harbour or shelter for

snails or insects completely avoided.—ED.) When the tree is completely loosened from the wall, the wall must be swept and anointed, and afterwards the tree, with the following composition:—

Four gallons of water,
One pound of soft soap,
Two pounds of common sulphur,
Half an ounce of black pepper,
One gill of train oil.

Let these be mixed together, and boiled for twenty minutes over a slow fire. It must be applied in a tepid state, by means of a soft brush. After the upper part of the tree is done, it will likewise be necessary to pay attention to the roots, in order to destroy those that have descended into the ground. "The means (says Mr. Harrison), which I have adopted with the greatest success, are—about one week previous to the time of laying the composition upon the upper part of the tree, a quantity of night soil is put into a tub, and half that quantity of soot; these mixed together with an addition of strong soap suds, remain in that state for one week, and are stirred up every day during that period; the mixture is then poured over the roots of the tree, for five or six feet round the bole. The before-mentioned applications will at once generally destroy this insect. In very bad cases, a repetition may be necessary the following winter."—Sir Oswald Mosley, Bart. (*Hort. Trans.* vol. iii.) recommends the application of *train oil*, by means of a painter's brush, to those parts of the tree infested by the aphides; and statesthat experiments conducted on a large scale, have abundantly proved the success of this application; he recommends *train oil* in preference to *linseed oil:* only a small portion of the tree can be operated upon at a time, for if the whole surface of the tree be covered with oil it will most probably die. Standard trees may be treated in every respect as wall trees.

2. *Canker.*—This is brought upon trees by various means; from injudicious pruning, from bruises, and in nailing, or from a bad subsoil; and in some cases it is an inherent disease. When any canker is observed, the part affected must, at the winter pruning, be cut clean out, and the part thus dressed be pared so that no water may be able to lodge in the wound. When this is done, let a quantity of soot be mixed up with water, after which let a little train oil be worked well amongst it, but so that the mixture may finally remain stiff; this must be plastered over all wounds that have been dressed, and it will generally remain without any securing to the branch, &c. The application of this mixture keeps out the wet from wounds where it would be likely to lodge, and both the soot and oil promote vegetation.

Mr. Wm. Nicol, of Newick Place, assures us that the canker in most instances may be avoided, by paying proper attention to the soil in which the tree is planted: and it would seem that gardeners generally are not conscious of this fact—for whenever a maiden tree is planted, they dig in the first place a large hole for its reception, and then fill it up with a prepared compost of well decomposed vegetable and animal matter; the tree readily takes root, puts forth vigorous branches, and soon comes into a bearing state. But this condition of things is of short duration; for unless the soil is occasionally or annually renewed, to supply the roots with proper nourishment and support, the tree gradually declines, and at length cankers and decays; but these results will seldom

occur if the surface-soil be good, for in that case, the roots will never descend into the prejudicial sub-soil, but spreading out their radicles in every direction, in search of food, the tree, as long as a proper supply of nutriment is afforded, will continue to thrive, and even luxuriate; but when, from any cause, this supply is withdrawn, the roots are compelled to descend into the stratum beneath, which, if uncongenial to the growth of the tree, will assuredly cause it to canker, and ultimately destroy it; hence, how erroneous and injurious the common practice of exhausting our fruit-tree borders by the growth of subsidiary crops—a practice that can never be tolerated, except in those instances where want of space renders its adoption unavoidable: in these cases, care should be taken to remedy the evil, by the timely renovation of the borders, in proportion to the exhaustion induced.

On the subject of canker, Mr. Stevenson, of Framfield, writes—"Having some of my apple trees affected by canker, I had an inclination to examine their roots, and cleared away the mould for that purpose: on examination, I found some had four, others three, and some only two main roots; then with an axe, I cut half of the main roots asunder, that is to say, if there were four main roots to a tree, I cut two of them asunder, about a foot from the body of the tree, and then again about six inches below, taking out the intermediate piece entirely; then returning the mould again, having previously well manured it, I expected the roots would send out fresh fibres; it had the desired effect, for the trees which, before the operation, were stunted and going fast to decay, began to move, throwing out fresh shoots, which have continued to thrive remarkably well ever since. These experiments were tried by me about six years ago; the idea, such as it is, is entirely my own, having never heard or read of any similar experiments."

6. Misletoe *(Viscum album)*, which is frequently fatal to apple trees, should be pulled out with hooks in frosty weather, when being brittle, it readily breaks off from the branches.

BLOSSOM.

In the spring, just before the blossom opens, it contributes very much to the certain setting of the fruit to pour a large quantity of water over the roots of the trees; as much as will settle to the depth of eighteen inches, or two feet, should be given. Manure water, when it can be procured, will be found to answer the purpose better, otherwise soft pond water. Were it not for this practice in dry seasons, a greater portion of the bloom or young fruit would drop off. After the fruit has begun to swell, the watering should be repeated.

FRUIT.

Taking and preserving the fruit.

The following judicious observations on the preservation of apples are from the pen of Mr. Gibb, of Kent.—*Gardener's Mag.* No. ix.

"The fruit should be gathered a little before it is quite ripe. In conveying it to the fruit room shallow baskets should be used, in which the apples are to be placed singly, and handled as carefully as if they were eggs. On reaching the fruit-room, the apples are to be taken singly out of the baskets, and placed upon shelves a very little apart from each other; but care should be taken that the room is previously well aired, and the shelves perfectly dry. In winter, if the weather is clear, the windows or ventilators should be kept open several hours each day; but when the weather is damp they are to be kept entirely shut,

and no fire should ever be used in the fruit-room, as it always causes a damp to arise, which does infinite injury to the fruit. I have found by experience that frost does not materially affect apples, for I have had apples completely frozen that kept equally well with the rest; but, then, no artificial means must be used to thaw the frost. After the first of March the fruit-room must be close shut up, for I have experienced that the admission of much air after that period causes the fruit to shrivel up and lose their colour; and they should be handled as little as possible after the month of May, nor should they ever be wiped until they are about to be used for the table, for they soon become unsound after being so treated. Apples will be found to keep better and much longer by this simple way, than by the usual practice of covering them with hay, straw, moss, or any thing else whatever; for fruit crowded together, or covered up with any material, will in a short time become heated and deprived not only of its gloss and colour, but also of its flavour. In the way I have recommended above, I have kept all the codlins and softer kind of baking apples good till the end of June, and the pippins, as well as various sorts of dessert apples, to the end of October, with their colour as fresh as when they were first gathered, and their flavour not in the least deteriorated. I have found by repeated experiments, that apples covered up any time are apt to contract a flavour of whatever materials they have been covered with. If laid, for example, on brown paper they will taste of tar. I have tried apples by wrapping them up in white paper, and although they have kept nearly as long in this way, they are always apt to shrivel up, which renders them unsightly."

As the best place for keeping ale is a good deep cool cellar, so also, according to Mr. Nicol, it is, with shelves properly fitted up, the best situation for keeping apples. The fruit may be laid upon clean straw when nearly ripe, and during a frost they should be secured, in total darkness, from its effects, until some days after a complete thaw has come on. It would appear that in America they are frequently frozen as hard as stones; if they thaw in the *light* they rot, but if they thaw in *darkness* they not only do not rot, but lose very little of their original flavour. Mr. Nicol asserts that apples would keep much better than they are generally kept if they were gathered at a *proper time;* to wait till some of the apples *fall* from the tree is a very unsatisfactory mode of proceeding. "To insure their keeping," says Mr. Nicol, "I always gather my apples just before they are ripe, and for this purpose I take four or five apples from different parts of the tree, and with a knife cut them asunder in the middle, and examine their kernels or pips; if they are plump and just beginning to turn brown, I am satisfied they are fit to gather; if, on the other hand, they have not attained their full size and plumpness, I am certain they would shrivel in keeping; and if deferred till the seeds are quite ripe and brown, they will not keep at all. These facts may be new to most of your readers, but I am confident it is the only certain criterion whereby we can ascertain the proper period for gathering apples."

To those of our readers who have not proper fruit-rooms, the following modes, as recommended in "*Practical Economy*," may occasionally prove useful:

"*Directions*:—After the apples have been kept for a week, and the superabundant moisture cleared away, wipe them with a dry cloth,

and pack them in glazed jars in layers of sand dried in an oven. Fit a piece of wood into the mouth of the jar, and tie a bladder over it. Let the jar stand on a shelf in a room not subject to much change of atmosphere. Or, place a dry layer of pebbles in the hollow of a glazed jar; fill the jar with apples rubbed dry; fit a piece of wood into the mouth of the jar, cover it with mortar, and place it on a shelf in a dry room; they will keep in this way for a long time, without losing any of their plumpness or flavour."

USE.

1. *The fruit*, for pies, tarts, sauces, and the dessert.
2. One-third of boiled apple pulp, baked with two-thirds of flour, having been properly fermented with yeast for twelve hours, makes a very excellent bread, full of eyes, and extremely palatable and light.
3. The fermented juice forms cider.
4. In confectionary it is used for comfits, marmalades, jellies, pasties, &c.
5. In dying, the bark produces a yellow colour.
6. The wood, firm, hard, and compact; hence used for turning.

APRICOT.

Apricot *(Prúnus Armeníaca)*, Icosándria Monogy'nia, Linn.; and Rosáceæ, Juss.

Of this excellent fruit the following varieties are in cultivation:—

With small but early fruit, ripening in July.—1. Early white Masculine. 2. Early red Masculine.

With fruit larger and of a superior flavour, but not ripening till the beginning or middle of August—1. Algiers. 2. Orange. 3. Roman. 4. Turkey. 5. Temple.

With large and well-flavoured fruit, but not ripening till the middle or end of August; succeeding both as espaliers and as standards—1. Breda. 2. Brussels. 3. Moor Park.

Choice of sorts.—The Moor Park and Turkey have been recommended where variety is not wanted; the former being fine and a good bearer. The latter not a good bearer, but very fine.

In procuring young trees, Mr. Wm. Nichols recommends purchasing them of a respectable nurseryman at *two years training*, in preference to *maiden plants;* for any inherent disease, or accident occurring at the budding season, will not be so clearly manifested at that age, as when the trees are of two years growth.

Culture, &c.

SOIL.

The apricot requires a rich soil, rather lighter than the apple and pear.

PROPAGATED.

By Budding. This is generally performed, from the middle of June to the end of July, on muscle or plum stocks, two or three years old. Mr. Bliss gives the decided preference to plum stocks.

TREE.

1. To be transplanted in open weather, from the end of October till spring. Forsyth says the best time is in August, when the leaf begins to fall.

2. Mode of Training. The fan method is very generally adopted with this tree. Forsyth recommends the horizontal manner; and Harrison also trains horizontally, but so as to let the branches have an elevation to their extremities of twenty degrees; varied, however, according to the luxuriance or weakness of the tree.

3. Mode of Bearing. The varieties of the apricot, in general, bear chiefly upon the young shoots of last year, and also upon small spurs rising on the two or three-year-old fruit branches. The Moor Park bears chiefly on the last year's shoots, and on close spurs formed on the two-year-old wood. The bearing shoots emit the blossom-buds immediately from the eyes along the sides, and the buds have a round and swelling appearance.

4. PRUNING.

1. Wall trees. The general culture of the wall-apricots, comprehends a *summer* and *winter* course of regulation, by pruning and training.

2. *Summer Pruning.*—Begin the summer pruning in May, or early in June; and continue it occasionally in July, August, &c. This pruning is principally to regulate the young shoots, of the same year. In the first place, take off close all the fore-right shoots, and others that are ill-placed or irregular, or too luxuriant in growth; taking care to retain a competent supply of choice, well-placed, moderately-growing side shoots, with a good leader to each mother branch. Continue these mostly at their full length, all summer; regularly trained in, close to the wall, to procure a sufficiency to choose from in the general winter pruning, for new bearers next year. If the summer regulation commences early, while the shoots are quite young, and as it were herbaceous, one, two, three, or four inches long, those improper to remain may be detached with the finger and thumb; but when of firmer growth, they must be removed with the knife. If any very strong shoot rise in any casually vacant part, it may be topped in June, which will cause it to produce several laterals of more moderate growth in the same year, eligible for training in, to supply the vacancy. But these laterals should be dispensed with as far as possible, as soon as the tree comes into a bearing state, because they never afford so *abundant a supply of fruit-buds*, in proportion to their *lengths*, as the *leading shoots.*

3. *Winter Pruning.* This may be performed, either at the fall of the leaf, or in mild intervals from that time, until the beginning of March. When it is deferred till the buds begin to swell, the promising shoots can better be distinguished. It comprehends a general regulation, both of the last year's shoots and the older branches. A general supply of the most regular-placed young shoots must every where be retained, for successional bearers the ensuing year. Cut out some of the most naked part of the last two years' bearers, and naked old branches not furnished with a competent supply of young wood, or with fruit-spurs, either to their origin, or to some well-directed lateral, as most expedient, to make room for training a general supply of the new bearers retained; and cut away all decayed wood and old stumps. Generally observe in this pruning, to retain one leading shoot at the end of each branch; either a naturally-placed terminal, or one formed by cutting into a proper leader, where a vacuity is to be furnished. Let the shoots retained for bearers be moderately shortened; strong shoots reduce in the least proportion, cutting off a fourth, or less, of their length; from weak shoots take away a third, and sometimes half. This shortening will conduce to the production of a competency of lateral shoots in the ensuing summer, from the lower and middle-placed eyes; whereas, without it, the new shoots would proceed

mostly from the top, and leave the under part of the mother branches naked, and the lower and middle parts of the tree unfurnished with proper supplies of bearing wood. Never prune below all the blossom-buds, except to provide wood; in which case, cut nearer to the origin of the branch. As in these trees, small fruit-spurs, an inch or two long, often appear, on some of the two or three years-old branches, furnished with blossom-buds, these spurs should generally be retained for bearing; but when any project fore-right far from the walls, cut them in accordingly; for spurs projecting above three inches, though they may set their fruit, seldom ripen it, unless the season and situation are both favourable. The thick clusters of spurs, which are apt to form on aged trees, ought also to be thinned. As each tree is pruned, nail it, laying in the branches and shoots from three to six inches distance, straight and close to the wall.

4. *Thinning the fruit.*—Sometimes the fruit is much too numerous, often growing in clusters; in which case, thin them in May and the beginning of June, in their young green state; leaving the most promising fruit singly, at three or four inches distance; or from about two to six on the respective shoots, according to their strength. The retained fruit should, in all instances, be situated at the *sides* of their respective shoots, and no *fore-right* fruit be suffered to remain; for these being exposed to the full power of the sun, will perish before they can arrive at maturity. The apricots so thinned off, and the first principal green fruit, are esteemed very fine for tarts.

5. *Pruning espaliers.*—The same as for wall trees.

6. *Pruning standards.*—Half standards will require only occasionally pruning, to regulate any branches which are too numerous, too extended, or cross-placed; and to remove any casually unfruitful parts and dead wood. At the same time, the regular branches, forming the head of the tree, should not be generally shortened, but permitted to advance in free growth.

7. *Insects and diseases.*—The apricot is very liable to be attacked by wasps and large flies, which should be kept off by a net. The other insects and diseases of this tree, are the same as in the peach tree; but it is not nearly so obnoxious to their attacks, probably owing to the comparatively hard nature of its bark and wood, and coriaceous leaves.

USE.

The fruit, both ripe and unripe.

ARTICHOKE.

Artichoke (*Cynára scòlymus*), Syngenésia Polygámia Æquális, Linn.; and Compósitæ, Juss.

Of this plant the following varieties are cultivated:—

1. *Globe Artichoke,* with large round dusky purplish heads, and the scales turned inwards at the top.

2. *Conical or French Artichoke.* The stalks of this variety generally grow taller than the former; the heads are smaller, and more conical; the scales are narrower, of a greenish colour, and not turned in at the top, as in the former.

3. *Jerusalem Artichoke* (Heliánthus tuberósus), Syngénesia Polygámia Frustránea, Linn.; and Compósitæ, Juss.

Culture, &c. of the Common Artichoke.

SOIL.

1. A rich light soil, and an open exposure.—In a wet soil the roots seldom outlive the winter.

2. Sea-weeds form one of the best manures for artichokes.

PROPAGATED.

By young suckers, planted in March or April, to the depth of four inches, in rows four and a half feet distance, and three feet apart in the row.—A thin crop of spinage may be sown before they are planted.

PLANT.

1. To be kept clear of weeds, and hoed during summer.

2. If any of the spring planting should not fruit in autumn, at the season of earthing up the roots, tie up the leaves with willow twigs, and lay the earth close up to them, so that the top of the plant may be above ground; and when the frost comes on, cover the top with a little straw, or peas-haulm, to guard off the frost. These plants will produce fruit in winter, or early in the spring.

3. After gathering the heads, break down the stalks, to encourage shoots from the bottom more effectually before winter.

4. The heads cut in November with the full stalk, and stuck in sand under cover, will continue good a long time.

5. The leaves of old plants bleached like cardoons, and preserved under a bed of sand, lose their bitter taste.

USE.

1. In England the full heads only are eaten, always boiled; in Italy they eat the young heads raw, with oil, salt, and pepper. The French dry the heads of the second crop on a string, like beads, with paper between; and use them with mushrooms in meat pies.

2. The stalks are eaten in France and Germany boiled, and seasoned with butter and vinegar.

3. The flowers have the property of rennet, in curdling of milk.

4. The roots are considered aperient and diuretic.

Culture, &c. of the Jerusalem Artichoke.

SOIL.

It will grow in any spare part of the garden, but an open compartment will be more favourable to the production of fine large tubers.

PROPAGATED.

By cuttings or sets, after the manner of potatoes; preserving not more than two eyes to each set.

PLANT.

1. The season for planting, from the beginning of March to the end of April.

2. Planted with a dibble, in rows, at three feet distance, and eighteen inches apart in the row, and about four inches deep.

3. In drills, by a hoe, after the manner of potatoes; at the same depth and distances.

4. As soon as the plants are above ground, the surface must be well hoed, drawing a little earth to the bottom of the stem, which is all the care they will require, until the time of gathering the crop.

5. In September or October, cut away the stem, and dig up the roots as wanted. In November, it will be proper to take up a quantity, and lay in dry sand, under cover, to be ready when the others are frozen in the ground.

6. Every tuber should be carefully dug up, or they will prove very troublesome, and pester the ground for years to come.

7. A fresh plantation must be made every year.

USE.

Before potatoes were known this plant was held in high esteem, and is yet considered very nutritious, and when boiled and mashed with butter, is by some considered to possess an excellent flavour.

ASH.

1. Common Ash (*Fráxinus excélsior*), Polygámia Diœ'cia, Linn.; and Oleínæ, Juss.

2. Mountain Ash (*Pyrus aucupária*), Icosándria Di-Pentagy'nia, Linn.; and Rosáceæ, Juss.

Culture, &c. of the Common Ash.

SOIL.

1. Will grow almost on any soil.

2. In damp meadows or moorish soils, becomes light, spongy, brittle, and of comparatively small value.

PROPAGATED.

1. From keys or seeds, which must be buried one year in beds or pots of sand, before they are sown.

2. Three bushels of sand is to be mixed with one bushel of seed, and the whole made pretty damp at the time of mixture. Four bushels of seed are sufficient for an acre.

TREE.

1. If removed when ten or twelve feet high, the grain acquires a degree of tenacity very prejudicial to the timber; and will not cleave into hoops.

2. In open groves they run to great lengths, are free-cleft, and make valuable timber.

3. Endures the sea-winds, and may therefore generally be planted upon the sea-shore, where few other trees will grow.

4. If seedling ash be planted at four feet distance, and at two years old cut within four inches of the ground, the stools will ten years after afford poles, generally three from each stool. The first five years they require weeding, after that no further trouble.—These poles serve for hurdles, hop-poles, hoops, laths, fencing, and what is termed post and billet for collieries. It has been known to shoot ten feet the first season after cutting.

5. As a source of profit, Mr. Cobbett speaks very highly of this tree. "If," says he, "the plantation be made with a view to profit, which is the only view which I ought to suppose the planter to have, the trees ought to be planted at very little more, if any, than four feet apart in every direction. If intended for underwood, as the ash generally is, they may be planted still closer; and I have often thought, and think still, that a plantation of ash, the rows only eighteen inches apart, and the plants not more than eight or nine inches apart in the row, would yield an enormous profit, if, in the first place, every other row were taken out, and every other plant in each of the remaining rows; if these were taken out at the end of six or seven years, they would be fit for hoops, and that too observe of *ground* ash, as the wood from these seedlings is called. The rest of the trees might remain till they had a growth of ten years, by the end of which time, they would, if properly treated, and in a pretty good ground, make *hop-poles of twenty feet long*. So that at the end of ten years from the day of

planting, an acre of land would yield *forty-three thousand and sixty hoops*, and *fourteen thousand five hundred and twenty hop-poles*.

The hop poles would be worth on the spot, in any part of England, two pounds the hundred, at least; and in some parts of it pretty nearly, if not quite, twice that sum. That sum, however, per hundred, would make the acre of ground yield *two hundred and ninety pounds*, in poles, in the course of ten years: the price of the hoops varies greatly, according to the local situation; but, on an average, they could scarcely be worth less than two pounds a thousand, which makes *eighty-seven pounds more*; and, of course, the total amount of the produce of one acre, in the space of ten years, three hundred and seventy-seven pounds. The costs would consist of rent, taxes, fencing, cutting down and trimming. The labour would be very nearly paid by the fagot wood; and I have no idea of any annual expence for fencings, and cultivation in the early stages of the plantation, to exceed four or five pounds an acre. In short, I think, I can defy any man to show that all the costs upon the acre, rows eighteen inches apart, and plants six inches apart in the rows, would exceed a hundred pounds in the course of the ten years, including every charge of every description, and allowing the land to be worth a rent of three or four pounds an acre. Here, then, in the first ten years, there would be gain, greater than can possibly be derived, in the ordinary way, in the course of four or five times ten years.

But this is not all; for the poles once cut down, there would come up from the stems another crop; not, I verily believe, equal to the first, but probably three times as great as ever was yielded by a common plantation: and if the near distances of the plants should cause a falling off in the rapidity of the growth, the plantation might be grubbed up; the roots all taken out; it might have a year or two in turnips, or other roots, and then be planted with ash again. If the plantation were in a part of the country where hop-poles were not wanted, the poles would be wanted for other purposes. If let stand till they be twelve, fifteen, or sixteen years old, they would be fit for wheelwrights, and for many of the numerous uses that ash timber is applied to. Finally, if you choose that this acre should become a plantation of ash trees of lofty stature, you have only, when you cut your poles, to leave one standing upon about every ten square feet; and, if these should be found to be, in a few years time, too near to each other, you have only, in proportion as they are in danger of becoming too crowded, to cut part of them out. Those that remained would subdue all the stems that were under them; but still there would be some underwood, and though of an inferior description, would much more than pay all the expences of keeping the plantation pruned and fenced.

In whatever way, however, the plantation be made, and with whatever view, the plants ought to be cut down nearly to the ground, the next year after they have been planted; that is to say, if planted in the fall, or in the spring, they ought to be cut down in the succeeding spring, and in the month of April. If planted in the spring of this year, they ought to be cut down in the month of April next year; and if planted in the last fall, they ought still not to be cut down, until they would have been cut down, if they had been planted in the spring. In other words, and for fear of being misunderstood on this point,

they ought to have *the growth of one summer*, before they be cut down.

6. Is usually fit for sheep cribs at nine or twelve years old, for hop poles from eleven to fourteen; but for carpenters and others use must stand from sixteen to twenty years.

7. Should not be planted in dairy fields, as the leaves communicate an incurable bad taste to the butter, during the time of their dropping in autumn.

8. Linnæus says, that while the ash is leafing there is scarcely any more frost; therefore green-house plants ought to be brought into the open air—*i. e.* about the 22nd of April.

USE.

1. For coachmakers, wheelwrights, coopers, &c.; hop-poles, spade handles, rake-stems pick-stems, and other implements of husbandry are made of it.—The shavings give to wool, prepared with bismuth, the true and permanent *vigogne* colour.

2. In Lancashire they lop the tops of this tree to feed the cattle in autumn, when the grass is upon the decline; the cattle peeling off the bark as food. This tree bears lopping. Horses and sheep are fond of the leaves.

3. The ashes of the wood afford very good potash.

4. The bark is used for tanning calf skins, and dying green, black, and blue.

5. As fuel, its wood is far better than any other sort that we have; its growth is almost the quickest; its various uses are all of importance; and its propagation, cultivation, and management, according to Mr. Cobbett, are all nearly as easy as those of a cabbage-plant.

Culture, &c. of the Mountain Ash.

TREE.

1. Is a native tree, and grows well in woods or open fields, and attains to a large size. It is cultivated in nursery gardens, and sold as a flowering shrub.

2. The wood is hard and durable.

3. Plants grow well in its shade.

USE.

1. The wood is fit for many economical purposes, such as mill-work, screws for presses, spokes for wheels, chairs, &c.

2. The roots are formed into handles for knives, and wooden spoons.

ASPARAGUS.

Asparagus (*Aspáragus Officinális*), Hexándria Monogy'nia, Linn.; and Asphodéleæ, Juss.

The varieties in cultivation are—

1. Red-topped, rising with a large head, full, close, and of a reddish green colour.

2. Green-topped, rising with a small head, not so close and plump, but reckoned better flavoured.

Culture, &c.

SOIL.

Should be light and rich; a sandy loam, well mixed with rotten dung or sea-weed, is accounted best.

PROPAGATED.

By SEED.

1. Generally sown broad cast, in March, not very thickly, often with a thin sprinkling of onions or radishes. The seed being slightly trodden in, the bed is raked smooth, and after the plants make their appearance, they are kept weeded, and well hoed once or twice during the summer. In the beginning of November, cover the ground

with litter or rotten dung, and in March or April, the roots may be transplanted into regular beds. This is a good method, but the plants are not fit to cut so soon, by a year, as from roots.

2. Asparagus beds are formed in two ways.

1. By sowing the seeds in beds at once.

2. By raising the plants elsewhere, and transplanting them into beds.

3. The ground should be trenched to the depth of three feet at least, then manured with well-reduced dung to the depth of six inches, or more, digging in the dung regularly one spade deep.—Mr. Nicol digs out a trench three feet deep, the whole width of his bed, then fills it up with layers of well-rotted manure, six inches in depth, and rich garden mould, twelve inches in depth; continued in alternate succession, till the trench is brought to a level with the surrounding surface. The surface of the bed is then prepared, and raked smooth in the usual way. The plants when about one or two inches in height, are planted by a line at the usual distances, and are then well watered; the plants soon establish themselves, and in three years prove remarkably *large* and fine, and *very productive*. They require no covering or protection during the winter, only cleaned and hand-weeded in the usual manner.

PLANTS.

1. When one year old, or at most two, to be planted in beds in March, at the distance of six or seven inches from the edge, and ten or twelve inches apart; to be planted against a ridge, formed by drawing trenches six inches deep, and the roots earthed with the hand, the crowns of the plants being two inches beneath the surface.

2. The beds four feet wide, with alleys two and a half or three feet wide.

3. The first year to be kept well weeded, and occasionally watered.

4. Should not be cut till the third year, after which, the beds will continue to bear ten or twelve years.

5. The shoots to be cut with a proper knife, when from two to four inches above ground, and at about six inches under the earth; slipping the knife close to the stem, to avoid wounding the young buds.

6. The beds to be dug to a moderate depth the middle or latter end of March, with a flat three-pronged fork, with blunt ends; and raked smooth.

7. In June weed the beds, and soon after the 20th or 24th, terminate the general cutting for the year.

8. In October the stalks to be cut down close, the beds weeded, and a spade deep of earth out of the alleys spread over them; "rather than treat them in this way," says Judd, "they would be better without any thing." He fills up the alleys with litter or dung to exclude the frost. Nicol recommends covering the beds with good dung, or fresh dung mixed with sea-weed, which he considers the very best manure for asparagus.

9. Old beds should have a dressing of very rotten dung once in two or three years, before the earth of the alleys is put on.

10. Gardeners generally, after the October dressing, plant colewerts or cabbages in the alleys; and a row of early beans, on the north or east side of the alleys; according to the direction in which the beds run, so as best to protect them from cold winds.

11. The plantation ought not to be less than a rod of ground, which will furnish only one good dish at a time. "Five square poles of ground," says Abercrombie, "planted with 1,600 plants in a productive state, will yield from six to eight score heads daily."

12. The asparagus is undoubtedly a much hardier plant than is generally imagined; and from a Catalogue of Plants, published by Mr. Cobbett in 1827, the following quaint observations are extracted: "Experience," says Mr. Cobbett, "has taught me that there is a general error prevailing as to the cultivation of this almost only garden vegetable that I ever eat, or think worth eating. There is such a *fuss* about making asparagus beds, and about managing them, that very few people, comparatively, have the plant at all; and gardeners (and they are in the right of it) would make us believe that they are not to be gotten except by a sort of conjuration. The fact is, that the plant is as hardy as any weed that ever grew. It will grow in any soil, and may be treated without any sort of ceremony. The roots go deep, and therefore the deeper the ground is trenched, and the better it is, the better the plants will grow. If you want asparagus with long white shanks, with a little tip of red at top, you must lay a good deal of earth upon the crowns for the stock to come through. But the plant does not *require* this, and it wants *no covering over* in the winter, nor care of any kind. The history of those I shall sell this year, will shew the nature of the plant as to hardiness. We dug up the seedlings last year, and put them upon mats in order to count them, and pick out the best. The refuse were flung in a heap in the garden, like a heap of the roots of couch-grass. There they lay from *December till April*, when having occasion to remove them to the dung-hill, in order to sow the plat on which they lay, I perceived that they were not only *alive*, but that their little buds *were actually beginning to start!* Oh, oh! said I, no wonder that the Yankees have such plenty of asparagus without covering, and without beds; things do not want beds and blankets if they can live out of doors at this rate. The heap went to the dung-hill; but when we had done sowing the tree seeds (which occupied all the ground), we went to the dunghill, took a parcel of these asparagus, and planted them in *alleys*, between some of the beds of tree seeds. Here they had to stand *walking* and *trampling* upon by the persons (not very ceremonious) who had to *weed* the beds many times during the summer; and yet of thousands of these plants thus treated, I do not believe that any died. Their stalks were at last, very nearly as high as asparagus generally, when old; and if they were to remain where they are, I have no doubt of their producing asparagus of a tolerable size next spring. This is quite enough to shew, that we have been in great error as to the cultivation of this plant. The ground ought to be well trenched and made rich, the rows a foot apart, and the plants about six inches apart in the rows. Between every *four rows*, there should be an alley of *two feet* to walk in, to cut the asparagus without treading upon the crowns; and if you want long white shanks, the earth should be thrown on the rows out of these alleys. The ground should be forked up in March, and be kept *quite clean* all summer; but there needs *no covering* and *no fuss*. If the soil be bad at bottom, clay, chalk, or gravel, the plants will give out when they reach it. Have some more ready to succeed them, then in another spot, and when that wears out, take another. A drill, a rod long,

will (if the seed be good), give plants enough for a new plantation; they may the next year be transplanted in pretty close rows, and the second year will be fit for final planting out.

USE.

1. The young shoots are in great esteem for their flavour and nutritious qualities.

2. They are much employed in Paris, by sedentary persons afflicted with symptoms of gravel, and other calculous affections.

ATMOSPHERE

The atmosphere is an elastic fluid which invests the earth. By saying that it is a fluid, we mean that it presses equally in all directions, or, in other words, has a tendency to move in all directions; and, consequently, rushes in and fills every place not previously occupied by a more solid substance. Hence we find, that every cave, crevice, place, and vessel, having communication with the atmosphere, if it be not filled with something else, is filled with air, against which it is no argument that we do not see it, because it is perfectly transparent, and consequently invisible. By saying that it is an elastic fluid, we mean that it has a spring and a tendency to stretch out indefinitely, when the weight above it is removed. This weight, by which any given portion of air is pressed together, is the air above it, which together with the compression it produces, consequently diminishes, as we ascend, until we arrive at the uppermost shell of aerial particles, whose spring upwards is resisted only by their own individual weight. Here, then, the air will be exceedingly thin, and between its density at the level of the sea, where the superincumbent weight is greatest, and its thinness at the top of the atmosphere, there will be every degree corresponding to the altitude. At the height of three miles, it is twice as thin as at the level of the sea; that is, one foot, if carried up from the lower level, would spring out so as to occupy two feet; and at the height of fifteen miles, one foot would spring out into thirty. How far above this, particles of air extend, we have no means of calculating; but, supposing that they are found at an elevation of fifty miles, which is generally assumed as their limit, even this altitude to our atmosphere, in relation to the diameter of the earth, would be something less than a tenth of an inch round a twelve-inch globe; and the dense part of it, constituting the region of heat and clouds, would not be much thicker than the paper which covers the globe. At the level of the sea, however, and at all habitable elevations, the air exerts a great pressure. A cubit foot weighs 535.08 grains, and the weight of the whole superincumbent column, and its pressure, which it has been already stated takes place in all directions, are not less than fifteen pounds on every square inch of surface. This seems a very strange statement, seeing that we are unconscious of any pressure whatever from this source, either on the surface of our bodies, or any where else. But it is not difficult to explain how we should be unconscious of this pressure; and there are many phenomena in nature which the doctrine of atmospherical pressure only can enable us to understand. We do not feel the pressure of the air, because our bodies are composed of films, which are pressed equally on all sides in the same manner through life, and because our organization has been adapted for this state of things. Nay, our nerves soon cease to convey a sensation of any thing which has acted on them uniformly, and for a long time, without injuring them; hence they give us no intimation of this, nor of many

other most interesting natural phenomena. But we are soon made sensible of the weight of the air, when by any means we remove its pressure from a portion of our bodies: suppose, for instance, we take a wine-glass, or other small vessel, and burn a bit of paper in it, the heat will expel a portion of the air, and if, when it is at its hottest, we extinguish it, by applying completely to the mouth of the glass the palm of our hand or our cheek, the air on the other side will squeeze either part of our body into the glass, because on that side it is not pressed so much. Still, however, we shall not feel the pressure of the air on the back of our hand, or inside of our cheek, because it is the same as before, and our nerves are consequently similarly affected. But we shall experience a strange sensation on the side where the pressure has been removed, and observe the parts swollen and bent downwards—phenomena which would result from a destruction of the equilibrium of pressure. No doubt, it seems more natural to think that our hand or cheek, is sucked rather than pressed in; but natural thoughts, suggested by unnatural sensations, are almost always false; and that this idea of suction, as if it were an active principle, though it obtained long in philosophy, and does so still in familiar discourse, is false, and in many cases not even so natural or obvious as that of pressure, easily might be shewn, were it not that the very name is completely exploded in every illustration of nature.

Let us, however, as it will illustrate other things, suppose for a moment that a man enters a steam bath, his head being out, that he may have free air to breathe, which is always necessary, and that when the bath is filled with steam, and the air consequently expelled from it, the bath is permitted to cool, and the air prevented from entering, to supply the place of the condensed steam. When he was immersed in steam, he experienced no inconvenience in breathing; because the pressure of the steam within was just equal to the pressure of the air without. But as the steam began to assume the form of water, the external air, unbalanced within, would press down his windpipe with more force than the muscles of his chest could resist, he would be suffocated by the excess of breath; his internal parts would be fearfully strained by distention; his body would perhaps burst (if he were not cured in this, as in most cases of disease, by the opening of the intestinal canal); and all this it is surely much more natural to ascribe to pressure from within, than suction from without.

The pressure of the atmosphere is also illustrated by the common pump. The implement commonly consists of a hollowed tree, or other tube, the lower extremity of which is immersed in the water of a well, and the upper furnished with a valve bucket and a lever to work it. At first, the tube being full of air, the water inside stands no higher than in the well. By the action of the bucket, the air is lifted out of the tube, and by the pressure of the air on the well, the water is squeezed in, till it arrives as high as the bucket, to be pumped out as the air was before it. Then when the pump is at rest, the pressure of the air in the well will sustain all the column of water which it lifted, unless the bucket be a bad one, and permit the air to ooze through it, which will press down the water to its natural level and so (*scoticé*) put the well off the fang.

It is evident, however, that there must be a limit to this lifting of water by the pressure of the air; for that pressure, as has been already stated, is never more than fifteen pounds on the square inch; and if we suppose the bore of the pump to be a square inch, the most that the pressure of the air can do is to lift fifteen pounds of water vertically, that is, a column

of about thirty-four feet. But such are the laws of the balancing of fluids, that neither by increasing the surface of the well, nor by diminishing the bore of the pump, nor by any other means, can we force the water higher by the natural pressure of the air alone; for columns are only pressed by columns of their own diameter. Therefore, no common sucking pump, however perfect in its mechanism, however large or small in its bore, can draw water, if the length between the highest position of its bucket and the surface of the water in its well be more than thirty-four feet. Nay, the impossibility of producing a complete vacuum by any such instrument, however perfect, the air which the water in being lifted disengages from its own mass, and the variations to which the pressure of the air is naturally subject, render it necessary that every pump shall be considerably shorter than thirty-four feet. This is, however, more fully explained as follows:—

In philosophical experiments, it is very convenient to make use of a heavier fluid than water, to shew the pressure of the air; for a vertical column of thirty-four feet is rather a cumbrous apparatus. It is therefore customary to substitute quicksilver, which is so much heavier, that a column of thirty inches is all that the pressure of air can raise, weighing as much as a column of water, having the same diameter, thirty-four feet long. This is something so manageable, that we may dispense with the lever and bucket altogether, and lift a column simply by filling a tube with it, more than thirty inches long, and closed at one end, and then inverting it in a cup of quicksilver. A glass tube thus filled, and inverted in a cup of mercury, is named a barometer, and in one form or other is found in almost every house. Not that in every house there are philosophers, but there are always people who are interested in the weather, and the barometer is a weather glass. It has been found by experiment, though we are unable to explain the phenomena, that much damp in the air over any place lightens it; and, consequently, shortens the mercurial column, which measures its weight. As it is thus when the air is very damp that bad weather usually comes, by finding that the mercury is falling we may often be able to prognosticate its arrival, or to guess, with some degree of accuracy, as to the quality of the coming weather.

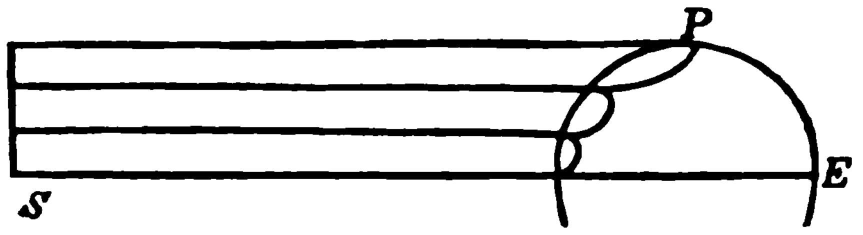
That we may be able to observe these changes more easily, the motions of the surface of the mercury are sometimes increased by making the upper portion of the tube oblique. If there should be nine such inches lying obliquely, and corresponding to 28, 29, 30, and 31, in the vertical column, between which the range of the barometer at the same level is always confined, then it will travel over nine inches between the extremes instead of three; for it is not the length in every position, but only the vertical length, that the pressure of the air determines. In another form of the barometer, more frequently found because it is a better piece of furniture, there is a dial-plate and index, which is made to revolve by a pully and a weight, or rather a float, on the surface of the mercury of the cup, which rises and falls along with it. That these variations of the level of the cistern or cup may be more considerable, it is made very small; in fact, it is only a part of the glass-tube turned up, in which the mercury, of course, always acts in opposition to the true column, and prevents it from falling so low as it otherwise would do. To assist the understanding of these instruments, the makers always write opposite to certain elevations certain words, such as *fair*, *rain*, &c., which would, indeed, be of some value if they were really adjusted to the instrument: because, so care-

lessly are common barometers usually made, that the part of the tube above the mercury is never truly a vacuum, and consequently the mercurial column is always too short. The makers, however, have got the art also of shortening the scale, so as to bring down the high numbers of inches, and cause the mercury to seem to stand very high. But as it is not so much the absolute height as the movements of the barometer which give indications of the weather, any instrument, if its real movements be seen, will answer the purpose; while none, however perfect, can be at all times trusted as a weather glass. For an account of the changes of the weather, as indicated by the barometer, see article *Barometer*.

We have thought it necessary to say so much on the pressure of the atmosphere, because, though it be natural philosophy, and not particularly agricultural in its bearings, yet almost the first step in science is to become acquainted with these facts, of which if we are ignorant, every natural phenomenon must remain a mystery. We shall now make some remarks upon the temperature of the air in which the agriculturist, more than any other man, is concerned.

The heat of the air is chiefly, if not altogether, produced by the rays of the sun. It is, indeed, comparatively difficult to raise the temperature of gaseous bodies, particularly when they are very thin. Being in the ultimate state to which heat can reduce them, it is not wasted on them. For though the present opinions of philosophers imply an excessive waste of heat, there is every reason to believe that, were the true theory discovered, we should find here the same economy as in other matters with which we are better acquainted. But though we cannot esteem the present hypothesis sound as to heat, this is not a place for criticism, and we shall use the common ideas. The atmosphere, at least in its more dense strata, near the earth's surface, is capable of having its heat raised from actual contact with the earth's surface, to which, perhaps, radiant heat contributes a little.

After this, there can be no doubt that the temperature of a place mainly depends on the quantity of the sun-beams alighting upon it. This for different places, must be very different, because the earth is not a flat surface facing the sun, but a globe, of which, of course, except the part which is nearest the sun, all the other parts lie back from him. It is not distance, however, that makes the difference, but the obliquity of the bases of all the cylinders of rays, except those which fall towards the centre, or equator of the globe. To render this more plain, let the accompanying circle represent the world, and the straight lines



from *s*, the boundaries of three equal cylinders or squares of sun-beams. Each of them will, of course, contain an equal quantity of heat, and the three portions of the earth's surface between *e* the equator, and *p* the pole on which they fall, will receive an equal quantity of heat; but the portion near the equator is evidently much smaller than that near the poles. It will, therefore, be much warmer, because the rays fall thicker upon it. In the same way, on a small scale, the face of a hill is warmer than its back, and southern than northern slopes, supposing the whole to be equally

in the sunshine. But this is not the only cause of the temperature of a place. Although it is of great advantage for a district to be fairly to the sun, and low, that (other things being equal) it may have a dense atmosphere over it, easily heated; yet the condition of the surface exerts a powerful influence, on the character of the neighbouring countries or seas.

Thus, if there be much marshy ground, wet land, or any condition of surface calculated to charge the air with damp, the air will be comparatively cold; because, as we have found in explaining the barometer, much damp in the air lightens it, and light air, as has been stated, is with difficulty heated. Water itself, too, whether in a liquid state or as a vapour, is extremely difficult to be heated, and, therefore, both circumstances combine to make wet lands, cold lands. It is very interesting to observe, how beautifully the laws of nature operate to keep down such a state of things, and how kindly they combine with the husbandman, rendering his labours to ameliorate the soil a means of improving the climate also. That there should not be much air cold and very damp at the same time, is provided for by the law, that the power of air to contain damp diminishes as its temperature falls; and that the climate shall be improved by improving the condition of the soil, and the improvement of the soil, once effected, be for ever kept up, is provided for by the same law. For when the surface has been drained, and the water run off to the sea, or gathered together in deep pools, which present but a small surface compared with a field, and from which, of course, a comparatively small evaporation can take place, then the average temperature of the place rises, and its average power of taking up damp increases; so that though the same quantity of rain should fall in the course of the year as before improvement, still the air will take it all up, and keep the soil in good condition. Instead, then, of ascribing the foulness of our pastures—the lateness and poorness of our crops—the stiffness of our land—the miriness about the farm—the wetness of the land—the coughs and consumptions of the family, to the quantity of rain that falls, let the ground be effectually drained, and the heart of the air will be warmed towards the farmer. Rain will be sent in due quantity to refresh the fields, but it will no longer be left in the furrows. The warm air will suck it up as soon as could be wished. Without drawing off the superfluous water, it may be safely stated, that an elevation in the temperature of the air would be productive of the most fatal consequences. Coughs, asthmas, and consumptions are certainly bad enough—yet, let us not say so: they are better than hunger. And if the climate be such that it will not grow corn enough, it is far better that disease should limit the number of inhabitants, than that an excess of strong men should be for ever fighting for food, and successively dying of hunger as they become too weak for the contest. But the fevers which originate from the lungs being exposed to cold damp air, in a sterile country, are mild to a degree (the very idea of death is often carefully banished by the disease), compared with those fierce and fatal ones generated by warm damp air, in regions of vegetable luxuriance. The intermittent fevers or agues of our own fenny districts, are light matters; but those which visit other climates of greater heat, rival the plague itself; to which, in fact, they are almost nearly related. Thus, in the year 1754 or 1755, a particular wind, named the *Harmattan*, which rushes from the south-east, upon the coast of Guinea, loaded with vegetable exhalations, with which it becomes charged in sweeping over the immense uninha-

bitable swamps and oozy mangrove thickets of the sultry regions of Benin, produced such devastation in the Negro towns that the living were not sufficient to bury the dead, and the gates of Cape Coast Castle were shut up for want of sentinels to do duty.—(*Good's Study of Medicine*, vol. ii. p. 65.)

But not only does the nature of the surface in reference to water (and, had we been particular, we might have said, in reference to colour, porosity, &c.) affect the temperature of the air; the character of the neighbourhood extends often a great many miles. Thus, who does not admit the coldness and injurious character of our east winds in spring? And yet they seem to be generated so far away as the snows of the north of Europe; but, because we have a more temperate climate and lighter air, at an earlier part of the season, they blow one way, having here a less pressure to keep them off. Such accidents as these we cannot help. Happily they send our vessels rapidly from the Baltic, laden with flax, and are disposed also to forward wool to us, in great quantities, to make warm clothing against their influence.

Having touched on the subject of winds, perhaps it may not be wrong to state a few things with regard to their cause and effects. The circumstances in which we see these best illustrated are in the cases of the land and sea breezes of climates warmer than our own. When the sun-beams shine down—we shall say upon an island—the island and the air above it are heated faster than the sea; for water, as has been already stated, is very slow in heating. Heated air is thinner or lighter than cold air; for it is a property of heat to expand all bodies, or rather we should say, that, we call air hot or cold according as it naturally is more or less expanded. But if the air over the island be lighter than that over the sea, it will be squeezed up into higher regions of the atmosphere, by the cool air from the sea pressing in upon it, which itself, in a little time, becomes heated over the land, and so is squeezed up in its turn by the air at its back; and thus, during the sunny hours of the morning and forenoon, a breeze blows in upon the land from the sea on all sides. During the absence of the sun, the current is reversed; because the sea, though longer in heating than the land, is also longer in cooling, and the air over the land is more heavy during the night than that over the sea. Now, this explanation as to the cause of the land and sea breezes (the former of which, by the way, is very well pronounced in our own climate during summer), supplies all that we know regarding the cause of winds, viz. a difference in temperature in different portions of air, and the destructions of equilibrium or stillness resulting from it. Electricity is, no doubt, powerfully concerned; but we are too ignorant of its action in the atmosphere to be able to avail ourselves of it in explaining the phenomena of fluids. The effects of winds upon the earth's surface is very beneficial; and, having selected the land and sea breeze to illustrate their cause, we may still make use of it to illustrate their effects. During the night, as has been stated, a breeze blows from the land, when men and animals generally are asleep, and when the vital functions of vegetables also, in consequence of the cold, are relaxed; when, in a word, the whole organic creation is less irritable than during the day. Now this land breeze, borne over the marshy grounds of the interior, is charged with unhealthy exhalations, and those organic particles which, of whatever nature they may be, are the cause of fever. We see, then, the wise provision in causing it to blow and carry off to the sea this noxious malaria, when

nature is asleep and animals housed. Nay, there is a moral in its breath; for though it blows over putrescent swamps, it is also wafted over mountains and valleys, covered, in these climes, with fragrant flowers: and though it is charged with infectious particles, like apothecaries' drugs they are disguised with delicious odours tempting the senses. But the man who indulges to excess suffers like all other voluptuaries. Let us now see how matters change in the morning: the sun rises, and wakes all nature; and after a devotional stillness for a time, when the bright hours of the day come, the breeze sets in from the sea, cooled and purified by the salt water from its putrescent particles, and worthy of being called *the Doctor*, by which name the English sailors designate the breeze.

In this case, then, we see the effects of winds in purifying the air over any given place. On the great scale, winds are equally efficient in purifying the whole atmosphere, by bearing it successively over the ocean, the absorbing power of which probably destroys its putrescent particles. This carrying to the ocean is not conducted with much regularity in our own latitudes, where, in consequence of the low temperature of the air, it is not so subject to be corrupted by decomposing plants and animals, and where the cold of winter probably destroys the life or morbid activity of these mysterious atoms. But in warm climates, there is a strong breeze constantly blowing over the Atlantic, Pacific, and Indian Ocean; and, were this the place for it, it might be shewn, that in a certain time, the whole atmosphere must perform the tour of these currents, and be swept clean by the ripple on the surface of the sea beneath. Besides purifying the air, winds are of very great use in carrying about heat from place to place, so as to equalize the temperature of the globe, as far as its globular form will permit. Aqueous vapour is borne about by them in the same way; and it is highly probable, that these great oceanic currents which have been mentioned as purifying the atmosphere, are the means also of charging it with a supply of moisture to refresh the dry land. They are also valuable in accelerating the spontaneous evaporation of water; for though the cause of the phenomena may not be very well understood, the fact is certain, that water is carried into the air much more rapidly when a strong wind is blowing, than when the air is calm.

If our globe were of the same quality of surface every where, the gradation of heat and climate, from the tropics to the poles, would be quite regular. But the irregular distribution of land and water gives rise to a very different state of things. The former, as has been stated, is much more easily heated than the latter; and as there is a much greater quantity of land in the northern than in the southern hemisphere, it is much warmer. For the same reason, countries having land lying south or sunward of them, enjoy a far more temperate climate than those which have sea, because the land diffuses northward, a part of its superior heat, derived from a more vertical sun. For this reason, the east coast countries of Europe are very temperate, being warmed by heat conducted from Africa or from our ocean, and from its own southern provinces. For the same reason, the western coast of America is comparatively cold; for an immense tract of ocean lies to the south and west.

But it is now time to remark, that the heat of the air not only depends on latitude, or its distance from the equator; the altitude of a place produces the very same effect. This arises from the fact, which has been already stated, that thin air is with much more difficulty heated, than dense

air, and we know that air becomes thin as we ascend. From experiment it is found, that for every three hundred feet that a place lies above the level of the sea, we must allow a degree less of mean heat, which, though it seems a small quantity, tells wonderfully upon the ripening of a crop. The consequence of this diminution of heat in the higher regions, is the existence of a certain altitude over every place where water can only exist in the solid form; where, in short, there is perpetual frost, and where, of course, all vegetation must cease. This line, named the snow line, or line of perpetual congelation, is not merely inferred from theory to exist in every region, for while we see it almost at the level of the sea in Greenland, there are mountains of elevation enough under the equator, to indicate the same. In fact, it was almost necessary that there should be portions of the earth's surface above this line, particularly in tropical countries, otherwise they would be insufferably parched during the summer. But, instead of this, how marvellously beautiful is the arrangement which creative providence has instituted? The same sun which drinks up the waters of the rivers and plains of South America, India, and Southern Europe, melts the snows of the Andes, the Himalayas, the Alps; and torrents are poured forth from sources where they cannot stagnate, and which are generally placed at the greatest possible distance from the sea. Then, when the winter returns, and the valleys and plains are parched no longer, the fountains of the glaciers are closed!

But, though not with good will, we must leave the subject of the temperature of the air, to make a few remarks upon its moisture. Here, however, but little that is edifying can be said, which has not already been introduced,—a circumstance the more to be regretted, since Agriculture is not less interested in this moisture of the air than in its temperature. It appears that electricity acts so powerfully in determining the condition in which aqueous vapour shall exist in dry air, and when it shall be poured down as rain, snow, or hail; that while we remain ignorant of its specific effects, little progress can be made in this branch of meteorology. The phenomena of dew and hoar frost, however, may be somewhat satisfactorily accounted for; and as the facts are not only very beautiful, but of obvious bearing on the culture of plants, we shall shortly explain the cause of dew.

From what has been said, it will be understood that there always exists in the air a certain quantity of aqueous vapour, depending on the temperature of the air, the ease with which it may be supplied, and, probably, some unknown electric affection. It is seen, when it ascends into high and cold regions, in the form of clouds, many of which are probably masses of impalpable snow or aqueous matter, having a temperature under the freezing point. There does not exist more vapour there, but the coldness of the air cannot take it up, or hold it dissolved in an invisible form.

Now this coldness, which naturally belongs to the higher strata of air, is frequently apt to be produced in the strata immediately contiguous to the surface of the earth; and then the aqueous particles formerly dissolved attach themselves to the herbage, and constitute dew. It is evident, that to produce such an effect it is only necessary that the surface of the herbage itself be cooled below that of the atmosphere above it. For if so, in consequence of the tendency which heat has to distribute itself equally all around, if the herbage be cold the contiguous strata of air will cool themselves to warm it; and if it send off its heat again, they will be cooled still more, and so on. Now, this is just what happens in

clear nights. During the day the soil and the herbage have been much warmed by the sun, and the air above them has had its share. In consequence of all this, the strata of air next the surface of the earth, being high in temperature, have a great demand for moisture, which in general they procure from the earth, or the upper strata. This, then, is their condition in the evening; but at night fall, the earth continuing to send off its heat instead of getting it from the sun, becomes cooled. The air immediately over the earth is also cooled, though not so fast, and being cooled can no longer retain all the moisture it took up when it was warmed. This moisture, therefore, settles upon the leaves of the herbage, or other substances having an affinity for it, which exist in the lower strata of air. A phenomenon precisely similar to this is observed on bringing a decanter of cold water, or cold wine, into a warm room. Its surface is very speedily covered with dew, which may be wiped off again and again, but will constantly be reproduced till the temperature of the decanter is raised so as not to cool the air immediately around it to that degree at which it lets go its moisture. Upon this principle the most convenient sort of hygrometer (an instrument for measuring the quantity of vapour in the atmosphere) is constructed. It consists of a thermometer, having a bulb of black enamel (that the deposition of dew may be more easily observed than if it were clear glass showing the mercury within), and having the back parts of the circumference of the bulb covered with a bit of fine linen, kept on with gum-arabic and a ring of ivory. When the bulb is dry, the instrument acts as a common thermometer; and the first part of an observation as to the quantity of moisture in the air is made with it as such. We first observe the temperature of the air, then we put a drop of ether upon the linen behind, which speedily flies off in vapour, carrying heat out of the bulb along with it. In this way we cool down the bulb till it arrives at the degree where dew is deposited upon it by the air. This degree we note, and having the temperature of the air first ascertained by the instrument used as a common thermometer, and the temperature of the dew point in it, we obtain the difference between these two degrees; and then we have all that is required for calculating the quantity of vapour existing in the atmosphere in the place where the observation was made. The indications obtained by this instrument, though they may not be of great use in enabling us to prognosticate rain, which originates in regions of air where we have no access with hygrometers, yet give us distinct information as to the dryness or wetness of the air around us, and as to the probability of dew or hoar-frost during night.

The difference between these two depositions consist solely in temperature. If the surface of the earth or herbage at the time that the moisture is deposited be above 32°, or the freezing point, dew is deposited; if it be under the freezing point, the aqueous particles assume the solid form, placing themselves successively according to the laws of the crystallization of water, and giving rise to the beautiful plumose forms of hoar frost.

Our readers, on reflecting on the explanation of the phenomena of dew which has now been advanced, will find themselves able to understand many facts which, though familiar, may previously have seemed unaccountable. Why, for instance, should dew be more abundant in fine clear weather than in cloudy weather equally warm, and in open lawn than under shade of trees? The reason given is, that in clear weather and in the open lawn, the surface of the earth, during night, is cooled farther down than if there were clouds and trees over it to reflect back again the heat

that streams up from it. Why, if we have risen by day-break are we so often astonished by finding the ground covered with hoar-frost after a fine clear day in spring or autumn? The reason is, that in very clear weather the ground cools itself so far, that there is scarcely a month in the year when it is not liable, at some hour of the night, to be cooled down to the freezing point. Why can we protect peach-blossoms, in early spring, from being destroyed by frost, simply by hanging a net over the tree? One would think that frosty air would have as free access to them through the meshes of the net as if they were altogether exposed. But it is not the air that is frosty, it is the blossoms themselves; and the net, like a cloud, prevents them from becoming cold to this degree; and as the object at this early season, in our climate, is to give the flower-buds as good a constitution as possible, to keep them cool but to prevent a chill, net-work over them may be a more appropriate covering than mats. But the quantity made use of any particular night should, of course, depend on the quantity of cold that would probably be generated on them during that night. *Quarterly Journal of Agriculture.*

BALM.

Balm (*Melíssa Officinális*), Didynámia gymnospérmia, Linn.; and Labiátæ, Juss.

Culture, &c.

PLANT.

1. Propagated by parting the roots in spring or autumn, and planting them from eight to twelve inches apart.

2. The plants must be kept clean from weeds; the decayed stalks cut off in September, and the ground stirred between them.

USE.

1. As a medicinal and culinary herb.

2. The leaves, green or dried, employed for making balm tea, which affords a grateful drink in fevers.

BARLEY.

Barley (*Hórdeum Vulgáre*), Tríandria digy'nia, Linn.; and Gramíneæ, Juss.

1. Spring or early Barley (*Hordeum Vulgare*). This is the sort principally cultivated in the southern and eastern districts, both of England and Scotland, and of which the farmers make two sorts, viz. the Common, and Rath-ripe Barley. The Rath-ripe is a variety of the former, occasioned by being cultivated upon warm gravelly lands; the seeds, when sown in cold or strong land, will, the first year, ripen near a fortnight earlier than the seeds taken from strong land, but lose wholly this advantage when the same seed is cultivated two or three years. It is often ripe in nine weeks after sowing.

2. Common Long-eared Barley (*Hordeum Distichon*). This is much esteemed for malting; but from the heaviness of the ears it is apt to lodge.

3. Sprat, or Battledore Barley (*Hordeum Zeocriton*). The straw is short and coarse, therefore not very good fodder for cattle. It has been sown with success in wet and dry grounds.

4. Winter, Square, or Bear Barley (*Hordeum Hexastichon*). This is a hardy species, but not so good for malting as the former; it has four or six rows of grain, and is sown in autumn.

Winter barley is chiefly sown in the north of England, Scotland, and in Ireland; being found to be more prolific in cold barren sandy lands than the common barley.

5. Bigg, Byg, or Barley Bigg, a variety of the winter barley, known by its always having six rows of grain, the grain being smaller, and the rind thicker, and its being earlier than the parent variety.

6. Siberian Barley (*Hordeum Cœleste*), a variety of the early barley.

7. Naked Barley (*Hordeum Nudum*).

Culture. &c. of Spring Barley.

SOIL.

Should be rather light than stiff, but of sufficient tenacity and strength to retain the moisture. On clays the grains are coarse and brown. A light rich loam, finely pulverised, forms the best soil; although excellent crops are obtained from soils of a chalky nature.

SEED.

1. Should be of a pale lively yellow colour and brightish cast, without any deep redness or black tinge at the tail; if the rind be a little shrivelled it is so much the better, and is a sure indication that its coats are thin; the husk of thick-rinded barley being too stiff to shrink, will lie smooth and hollow, even when the inside flour has shrunk from it.

2. The best season for sowing barley is considered to be from the middle of March to the middle of April. Bigg may be sown either in autumn to stand the winter, or as late as the first week in June. In England, the Winter or Four-rowed Barley (*H. hexástichon*), is frequently sown in autumn, and stands the most severe winters.

3. When barley is sown too late, it is sometimes steeped in clean water for twenty-four hours, it will come up much earlier than dry seed: the light corn that floats should be removed, and the sower must put in a third or fourth more seed in bulk than is usual of dry grain, as the grain is swelled in that proportion, and the whole must be harrowed as quickly as possible after it is sown. Barley that has been wetted for malting, and begins to sprout, will soon come up.

4. In a trial made between sowing it drilled and broad-cast, the extra produce of the drilled crop was very considerable. The broadcast mode, however, is almost universally adopted. A single grain set, or drilled, has been known to produce eighty stalks.

5. The seed requires changing frequently, if not, the crop will be coarse; and, if intended for malt, should not have been grown on the soil where it is intended to be sown, but ought to be taken from some totally different soil, in a remote situation.

PLANT.

1. Rolling makes it separate into a greater number of stalks.

2. If the blade grows rank, mowing is better than feeding with sheep, as the sheep are apt to bite so low as to injure its future growth.

3. In the harvesting of barley more care is requisite than in taking any of the other white crops, even in the best of seasons; and in bad years it is often found very difficult to save it. It is known to be ripe by the ears drooping and falling, as it were, doubly against the straw. Owing to the brittleness of the straw, after it has reached a certain period it must be cut down; as, when it is suffered to stand longer, much loss is sustained by the breaking of the heads. On that account it is cut by some at a time when the grain is soft, and the straw retains a great proportion of its natural juices, consequently requires a long time in the field before either the grain is hardened or the straw sufficiently dry. When put into the stack sooner it is apt to heat, and much loss is frequently sustained. It would appear, however, that a practice quite the reverse of this obtains in Sussex, where the barley is seldom cut until it is quite ripe, or what the farmers call *sickle laid*. Barley is generally cut down in England with the cradle-scythe, and either tied up or carted home loose, after lying in the swarth some days to dry. It is not apt

to shed; but, in wet weather it will sprout or grow musty, and therefore every fair day after rain it should be shaken up and turned, and when it is tolerably dry let it be made up in shocks; but be careful never to house it till thoroughly dry, lest it mow-burn, which will make it malt worse than if it had speared in the field.

4. The average produce of barley in England is about thirty-two bushels per acre; the produce of barley in flour is twelve pounds to fourteen pounds of grain; and an imperial bushel of very good barley, on an average, weighs fifty-one pounds and a half.

USE.

1. The rath-ripe, having the thinnest chaff, is the best for Malt.

2. The long-eared Barley is generally employed for malting; the bad coloured and sprouted being used for fattening cattle, pigs, &c. In the Wield of Sussex the farmers sow this barley as early as March, in a season of one ploughing; "but the common and best preparation," says our correspondent, "is a winter fallow, the seed sown in April or the beginning of May, the land being previously ploughed three times, well harrowed, rolled, and brought to what the farmers call a fine tilth. Should the season prove favourable, the crop on good lands will produce from seven to eight quarters per acre; but, in Sussex, four quarters per acre may be considered as the general average."

3. It is a common practice, in the spring, with many of the South-Down farmers to steep Tail Barley (barley of an inferior or second quality) in the same way as barley is steeped in the process of malting, and, when speared, to give it their horses in the place of oats; this food being considered, by them, more nutritious than oats, and better adapted for horses when in hard work,

4. The straw is used as a winter fodder for cattle, being more nutritious than oat straw, which is said to produce jaundice both in neat cattle and horses.

5. Pearl Barley. A variety of the long-eared barley is cultivated in Northumberland, whose awns mostly drop, or are easily shaken off when ripe; from the grain being shorter, plumper, and rounder bodied than the common sort, it is preferred by the millers for making into pearl barley. It ripens later than the common sort by nearly a fortnight.

6. Winter Barley (*Hordeum Hexastichon*) is very advantageously employed by the South-Down flock-masters as spring food for sheep, for which purpose it is sown in autumn, fed in May and June, and then laid off, the crop coming to harvest about the latter end of September; the grain is unfit for malting, and therefore used for fattening pigs, poultry, &c. Some farmers sow this barley to cut as green or summer fodder for horses, cattle, &c., but it certainly is not so good for that purpose as either rye, tares, vetch, or clover; and if suffered to remain too long before it is cut, and the ears ripen, the cattle are often greatly inconvenienced by the beard, or hilt, piercing the inside of their cheeks and mouths, causing great pain and trouble before it can be extracted. The straw is generally employed for thatching, being too hard and tough for winter fodder.

7. Large quantities of barley, cultivated in England, are converted into beer, ale, porter, and British spirits.

8. Malt is the great purpose to which barley is applied in this country. To understand the process of malting it may be necessary to observe, that the cotyledons of a seed, before a young plant is produced, are changed by the heat and moisture of the earth into sugar and mucilage. Malting grain is only an artificial mode of effecting this, by steeping the grain in water fermenting it in heaps and then arresting its progress towards forming a plant by kiln-drying, in order to take advantage of the sugar in distillation for spirit, or in fermentation, for beer. The grain of barley contains starch and sugar; and the chemical constituents of both these ingredients are very nearly alike. In the process of malting, a portion of this starch is converted into sugar; so that the total quantity of sugar, and consequently the source of spirit, is increased by the transformation.—*Loud. Encycl. Agr.*

BAROMETER.

IN the present state of philosophy, we are unable to explain *how it is* that a tendency to rain, or snow, or excessive winds in the atmosphere, should diminish the pressure of the air, and cause the mercury to fall in the barometrical tube; but of the fact there can be no doubt, and observation and experience have sufficiently proved that as a correct indicator of the changes in the weather, the barometer is an instrument of considerable value to the intelligent farmer. For a philosophical description of this instrument, see article *Atmosphere*.

The words generally engraved on the plate of the barometer, rather serve to mislead than to inform; for the changes of the weather depend rather on the rising and falling of the mercury, than on its standing at any particular height. When the mercury is as high as "Fair," or at 30 inches, and the surface of it is concave, beginning to descend, it very often rains; and on the contrary, when even the mercury is at 29 inches, opposite to "Rain," when the surface of it is convex, beginning to rise, fair weather may be expected. These circumstances not being known, or duly attended to, is the principal reason why farmers and others have not a proper confidence in this instrument.

The following rules, by Mr. Patrick, may be considered as useful indications of the changes of the weather by means of the barometer:—

1. The rising of the mercury presages, in general, fair weather, and its falling, foul weather, as rain, snow, high winds, and storms.
2. In very hot weather, the falling of the mercury indicates thunder.
3. In winter the rising presages frost; and in frosty weather, if the mercury falls three or four divisions, there will certainly follow a thaw; but in a continued frost, if the mercury rises, there will follow snow.
4. When foul weather follows soon after the fall of the mercury, expect but little of it; and, on the contrary, expect but little fair weather if it follows shortly after the rising of the mercury.
5. In foul weather, when the mercury rises much and high, and so continues for two or three days before the foul weather is quite over, then expect a continuance of fair weather to follow.
6. In fair weather, when the mercury falls much and low, and thus continues for two or three days before the rain, then expect a great deal of wet, and probably high winds.
7. The unsettled motion of the mercury denotes uncertain and changeable weather.
8. In the beginning of April, the barometer sinks very low, with bad weather; after which it seldom falls lower than 29 inches, 5 tenths, till the latter end of September or October, when the quicksilver falls again low, with stormy winds, for then the winter constitution of the atmosphere takes place. From October to April, the great falls of the barometer occur from 29. 5, to 28. 5, and sometimes lower; whereas, during the summer constitution of the air, the quicksilver seldom falls lower than 29 inches 5 tenths. It therefore follows, that a fall of one tenth of an inch during the summer is as sure an indication of rain, as a fall of between two and three tenths is in the winter.

Observations by Mr. Kirwan.

1. That when there has been no storm before or after the vernal equinox, the ensuing summer is generally dry, five times in six.
2. That when a storm happens from an easterly point either on the 19th, 20th, or 21st of May, the succeeding summer is generally dry, four times in five.
3. That when a storm rises on the 25th, 26th, or 27th of March, and not before in any point, the succeeding summer is generally dry, four times in five.
4. If there be a storm at south-west, or west-south-west, on the 19th, 20th, 21st, or 22d of March, the succeeding summer is generally wet, five times in six.

Rules respecting the Barometer, drawn from observation.

1. In winter, spring, and autumn, the sudden fall of the mercury for a large space denotes high winds and storms; but in summer it denotes heavy showers, and often thunder; and it always sinks lowest of all for great winds, unaccompanied with rain: though it falls more for wind and rain together, than it does for either separately.
2. After rain, if the wind changes to any part of the north, with a clear and dry sky, and the mercury rises, it is a certain sign of fair weather.
3. After very great storms of wind, when the mercury has been low, it commonly rises again very fast. In settled, fair, and dry weather, except the barometer sinks much, expect but little rain; for its small sinking then is only for a little wind, or a few drops of rain, and the mercury soon rises again to its former station. In a wet season, suppose in hay-time or harvest, the smallest sinking of the mercury is to be minded, for when the constitution of the air is much inclined to showers, a little sinking of the barometer denotes more rain, as it never then stands very high. And if in such a season it rises very suddenly and high, expect not fair weather more than a day or two, but rather that the mercury will fall again very soon, and rain immediately follow. The slow gradual rising, and keeping on for two or three days, being most to be depended or for a week's fair weather; and the unsettled state of the quicksilver always denotes uncertain and changeable weather, especially when the mercury stands about the word Changeable.
4. The greatest heights of mercury in this country are found upon easterly or north-easterly winds; and it may often rain or snow, the wind being in these points, and the baro-

meter sink little or nothing; or it may even be in a rising state, the effect of these winds counteracting. But the mercury sinks for wind as well as for rain in all the other points of the compass, but rises as the wind shifts to the north or east. But if the barometer should sink in that quarter, expect it to change soon, or else, should the fall be much, a heavy rain is likely to ensue, as it sometimes happens.

PROGNOSTICS OF THE WEATHER, DERIVED FROM NATURAL APPEARANCES.

Red clouds in the west at sunset, especially when they have a tint of purple, portend fine weather. The reason of which is, that the air when dry refracts more red or heat-making rays; and as dry air is not perfectly transparent, they are again reflected in the horizon. *A copper or yellow sunset* generally foretells rain; but as an indication of wet weather approaching, nothing is more certain than the halo round the moon, which is produced by the precipitated water; and the larger the circle the nearer the clouds, and consequently the more ready to fall. The old proverb is often correct:—

A rainbow in the morning, is the shepherd's warning;
A rainbow at night, is the shepherd's delight.

A rainbow can only occur when the clouds, retaining or depositing the rain, are opposite to the sun; and in the evening the rainbow is in the east, and in the morning in the west; and as our heavy rains in this climate are usually brought by the westerly winds, a rainbow in the west indicates that the bad weather is on the road, by the wind, to us; whereas the rainbow in the east, proves that the rain in these clouds is passing down from us.

When the swallows fly high, fine weather is to be expected or continued; but when they *fly low* and *close to the ground*, rain is almost surely approaching. This is explained as follows:—Swallows pursue the flies and gnats; and flies and gnats delight usually in warm strata of air; and as warm air is lighter and usually moister than cold air, when the warm strata of our air are high, there is less chance of moisture being thrown down from them by the mixture with cold air; but when the warm and moist air is close to the surface, it is almost certain that, as the cold air flows into it, a deposition of water will take place.

A "Weather Table" under the pretended sanction of the late Sir W. Herschel, has been extensively circulated; and therefore it may be proper to state, that such table is neither *authentic*, nor *in the least to be depended upon*.

It may be more necessary to caution our readers against reliance on the prophecies concerning the Weather, inserted in Moore's and other annual almanacks. Those who have attentively perused this article and the preceding one on the Atmosphere, cannot fail to have drawn this conclusion— that the changes of the weather are occasioned by causes (both general and local) which it is impossible for man to anticipate for a greater period than a few hours, or two or three days at most. How then can predictions intended for a whole year, and which are actually sent to press several months before its commencement, be considered as having any just foundation? Besides, these predictions are made applicable to the whole kingdom, although it is notorious, that the weather is often totally different at the same moment, in distant parts of the island.

Almanacks have in general a short-lived existence; but if any one who has preserved a series of them for twenty or thirty years, will institute a comparison, with respect to the predictions on the weather, he will find the changes rung upon them over and over again, without any other than mere verbal alterations. The secret of the confidence too generally

placed in this portion of the common almanacks is this. Every body knows, that the motions and phenomena of the heavenly bodies are laid down in them with unerring precision; but not one person in a thousand is able to appreciate the methods by which this great accuracy is attained; and therefore the bulk of mankind are disposed to attribute an equally sure foundation for every thing which the almanack-maker chooses to advance: and when once they begin to have faith, it is greatly fostered by the ambiguous style of the predictions themselves, whereby the disciples of "Francis Moore, Physician," are enabled to discern in a majority of cases, a coincidence between the prediction and the event, which to an unprejudiced mind would appear little less than a perversion of common sense!

To conclude in the words of a recent writer:—"It is perfectly impos- "sible that these predictions can be any thing but guesses; often, of "course, very false guesses—and guesses certainly not applicable, if even "they approached the truth, to all parts of the kingdom—for it may rain "in a mountainous country, and be fine in the neighbouring plains, on "the same day. We know from scientific observation, that in the month "of June, the atmosphere is at the highest point of dryness, and that the "average number of days on which rain falls, is lower than that of any "other month of the year. With these established facts to contradict the "prophecy, it is predicted by Moore's Almanack for 1829, that from the "10th to the 20th of June, the atmosphere will be moist, with rain and "thunder in many places. If any farmer believe this nonsense, it is "highly probable that during the above interval he may lose some days "of actual fine weather, in dread of the rain which the almanack pre- "dicts, and thus his hay will remain on the ground, instead of being "safely in the rick; and further, that when he hopes for the fine weather, "which the same almanack ensures from the 24th to the end of the month, "he may experience heavy showers, and be driven on to the periodical "rains in the middle of July, with no consolation for his losses but the "conviction, that it is better to trust to common sense and experience, than "to predictions expressly manufactured to impose upon the ignorant."

BASIL.

Basil (*O'cymum*), Didynámia Gymnospérmia. Linn.; and Labiátæ, Juss.

1. The Sweet or larger Basil (*O'cymum Basílicum*).
2. The bush or least Basil (*O'cymum Mínimum*).

Culture, &c.

PROPAGATED.

By seeds sown in March upon a moderate hot-bed.

PLANTS.

The plants from seed to be soon transplanted upon a second moderate hot-bed, gradually inured to the air; and transplanted in May, on warm borders, a foot apart, with a ball of earth about their roots.

USE.

In salads and soups; the peculiar flavour of mock-turtle soup is derived from this valuable pot-herb.

BEAN.

Bean (*Vícia Fába*), Diadélphia Decándria. Linn.; and, Leguminósæ, Juss.

In treating of the Bean it will be necessary, for the sake of reference, to adopt the following order:—1. Field Beans. 2. Garden Beans. 3. Kidney Beans.

1. Field Bean.

Of these the following varieties are cultivated:—

1. Horse Bean.
2. Tick.
3. Massagan Bean, not so productive as the Tick, but sells for more, and ripens three weeks sooner.
4. Long-pod Bean.
5. Dutch Bean. Grows five feet high, has from twenty to seventy pods; the number of seeds from one single bean 114, which on allowing an average of three beans and a half to a pod, is 399.

This bean should be sown thin, and as early as possible, that in wet summers it may ripen in due time for wheat to follow.

Great variety is produced by planting different sorts near each other.

☞ A new variety of bean, called the *Russian Bean*, has lately been introduced into England, and cultivated by Mr. Thorpe, at Barcombe, in Sussex. It is sown or planted in autumn; and the advantage it has over the common bean is, that it will stand the frosts, and will be ready for harvesting two months before the usual time. A loamy soil is best calculated for its growth. The publisher has been supplied with a few of these beans, and in autumn 1829, planted both the Common Bean and this Russian Bean. Both seemed alike during the severe winter of 1829-30, and it was thought by many that the English bean would be ready for harvesting as soon as the other; but when spring came on, the warm days and frosty nights soon destroyed the English Bean, while the Russian still flourished.

Culture, &c.

Soil.

1. All the varieties thrive best in strong, moist, clayey soils; they will not suit light sandy lands, or late climates.

2. The roots of some being above a foot long, require that depth of soil.

3. In the preparation of the soil, much depends on the nature of the land and the state of the weather; for as beans must be sown early in the spring, it is sometimes impossible to give it all the labour which a careful farmer would wish to bestow. It must also be regulated, in some measure, by the manner of sowing. In all cases it ought to be ploughed with a deep furrow after harvest, or early in winter; and as two ploughings in spring are highly advantageous, the winter furrow may be given in the direction of the former ridges, in which way the land is sooner dry in spring, than if it had been ploughed across. The second ploughing is to be given across the ridges as early in spring as the ground is sufficiently dry; and the third furrow either forms the drills, or receives the seed.

4. Mr. Brown, one of the best bean-growers in Britain, gives the following directions:—The furrow ought to be given early in winter, and as deep as possible, that the earth may be sufficiently loosened, and room afforded for the roots of the plant to search for the requisite nourishment. This first furrow is usually given *across* the field, which is the best method when only one spring furrow is intended; but as it is now ascertained that two spring furrows are highly advantageous, perhaps the one in winter ought to be given in length, which lays the ground in a better situation for resisting the rains, and renders it sooner dry in spring, than can be the case when ploughed across.

On the supposition that three furrows are to be given, one in winter and two in spring, the following is the most eligible preparation. The land being ploughed in length, as early in winter as is practicable, and the cross gutter and headland furrows sufficiently digged out, take the second furrow across the first as soon as the ground is dry enough in spring to undergo the operation; water furrow it immediately, and dig again the cross gutter and headland furrows, otherwise the benefit of

the second furrow may be lost. This being done, leave the field for some days, till it is sufficiently dry, when a cast of the harrows becomes necessary, so that the surface may be levelled. Then enter with the ploughs and form the drills.

PROPAGATED.

1. By seeds, which may be sowed broad-cast, drilled, or dibbled; if sown *broad-cast* two bushels and a half, four bushels, or five bushels of seed will be required, which should be ploughed or harrowed in.

2. *Drilled.*—There are two modes of drilling beans. In one of these, the lands or ridges are divided by the plough into ridgelets, or "one bout stitches" at intervals of about twenty-seven inches. If dung is to be applied the seed ought to be first deposited, as it is found inconvenient to rún the drill-machine afterwards. The dung may then be drawn out from the carts in small heaps, one row of heaps serving for three or five ridgelets; and it is evenly spread and equally divided among them. The ridgelets are next split out or reversed, either by means of the common plough, or one with two mould-boards, which covers both the seed and the manure in the most perfect manner. When beans are sown by the other method, in the bottom of a common furrow, the dung must be previously spread over the surface of the winter or spring ploughing. Three ploughs then start in succession, one immediately behind the other, and a drill barrow either follows the third plough or is attached to it, by which the beans are sown in every third furrow, or at from twenty-four to twenty-seven inches asunder, according to the breadth of the furrow-slice.

3. *Another improved way of sowing beans*, when dung is applied at seed-time, is to spread the dung and to plough it down with a strong furrow; after this, shallow furrows are drawn, into which the seed is deposited by the drill-machine. Whichever of these modes of sowing is followed, the whole field must be carefully laid dry, by means of channels formed by the plough, and when necessary by the shovel; for neither then nor at any former period should water be allowed to stagnate on the land.—*Loud. Encyl. Agric.*

4. It is now become a general practice to mix a small quantity of peas with the beans, both in the drill and broad-cast method. The quality and quantity of the straw is greatly improved by this mixture.

5. *Dibbling.*—This practice is pretty generally adopted by the Sussex farmers, but the best cultivators prefer the drill system; whichever mode of sowing is adopted, the seed must be sown the end of January or beginning of February, and certainly not later than March.

6. May be drilled or planted so early as the month of December, from whence may be derived the advantage of an early harvest; in which case the straw will be far more valuable than that from a later planting or drilling.

PLANT.

1. Weeded by means of the horse hoe followed by the hand hoe.

2. When in rows to be earthed up.

3. The taking off of the tops of the beans just as the blossoms are set, not only improves the quality, but increases the quantity, and causes them to ripen sooner. It also destroys the black fly (*Aphides*) on their tops.

4. Beans are generally cut off above ground with a scythe or reaping hook; but if the haulm is short (as that of the long-pod and massagan are) they are, in some places, pulled up by the roots.

5. Should remain in the stack till Christmas to harden.

USE.

1. A more hearty and profitable food for horses than oats. By an experiment instituted for the purpose of ascertaining the relative value of oats and beans, a bushel of beans and chaff were substituted for a sack of oats, with chaff to serve the same time; the result proved that the beans were superior to the oats, from the life, spirit, and sleekness of the horses.

2. Bean straw when mixed with peas, affords as much nourishment, when properly harvested, as hay of ordinary quality.

3. The produce of beans averages twenty-five to thirty-five bushels per acre; a bushel of beans yields fourteen pounds more flour than a bushel of oats.

2. Garden Bean.

1. Early Massagan—A great bearer, and a good sort. The seed is procured from Portugal: after being planted two years in England, the seed grows larger, and does not ripen so soon; which is called a degeneracy.
2. Early Spanish or Lisbon—A small and sweet bean.
3. Sandwich—A good bearer, larger and hardier than the Windsor.
4. Windsor—One of our best-tasted beans when young; not a hardy kind.
5. White-blossomed—A good sort and bears well. The seed when old is black, and apt to degenerate, if not saved with care. Smallish, middling.
6. Green Genoa.—Seed when old, green. A late bean.
7. Dwarf Cluster, or Fan—Grows only from six to twelve inches high; the branches spread out like a fan, and the pods are produced in clusters.
8. Early long pod.
9. Large long pod.
10. True sword pod.
11. Mumford.—Smallish, middling.
12. Broad Spanish.
13. Toker—A good bearer. Middling large.
14. Red blossomed.
15. Green Nonpareil—Smallish.

Culture, &c.

PROPAGATED BY SEEDS.

1. For an early crop—Sow some Massagans on a border under a south wall, or other fence, from the last week in October to the end of November; if the border is five or six feet wide, sow crossways in rows two and a half feet asunder; if the border is narrow, one row near the wall, and the other two and a half feet from it.

In the first case, a row should be planted near the wall, which often survives the winter; while those at a greater distance are destroyed.

2. Sown from December till June in open ground.

3. Beans may be forwarded by sowing them thickly on a warm border, and planting out.

4. The seed for late crops, should be planted in rows three feet asunder, and according to the size from four to six inches apart, and two and a half inches deep.

5. In double rows four or six inches apart, and alleys from one to three feet wide.

6. For early crops, one pint of seed, for every row of eighty feet will be required, for main crops one pint for every sixty feet.

PLANT.

1. To be earthed up; especially the early ones, to protect them from frost.

2. If planted in rows one foot asunder, and when five or six inches high, the alternate rows cut off two or three inches from the ground, they will produce two crops; the uncut in July, and the cut in August or September.

3. If the stalks be cut off within six inches of the ground when the flowers begin to appear, new stems spring from the stools and produce a second crop late in the season.

USE.

The seeds for soups, or dishes for the table.

3. Kidney Bean.

Kidney Bean (*Phaséolus*), Diadélphia decándria. Linn.; and Leguminósæ, Juss.

a, The Runner or Climbing Bean (*Phaséolus multiflórus*).
b, The Dwarf or French Bean (*Phaséolus vulgáris*).

a, Running or Climbing Bean.

1. Scarlet Runner, the most prolific and longest bearer, and best adapted for a main crop; seeds and flowers red.
2. White Runner, like the scarlet, but the seed and flowers are white.
3. White Dutch or Long-podded Runner—Pods long and smooth, but does not continue so long in flower as the two former; a great bearer, and grows as luxuriantly as hops.
4. Canterbury—Small Runner.
5. Battersea—Small white runner.
6. Variable Runner.

Culture, &c.

SOIL.

Requires a light and very rich soil.

PROPAGATED BY SEEDS.

1. Sown from May till the beginning of July.

2. Planted about five or six inches apart, and an inch deep: the drills for the larger kinds to be five feet asunder.

PLANT.

1. When five or six inches high, require long poles, pea-sticks, or pack-thread pegged tight in the ground, and fastened to the top of a wall, or other fence, at the distance of a foot apart.—The Scarlet and Dutch will grow upwards of fifteen feet high.

2. The plants to be earthed up; and when the roots are exposed to the sun, covered with fresh horse-dung.

3. The pods are in the highest state of perfection when young, tender, fleshy, and brittle. They should be gathered young, and on no account suffered to grow old, as it tends to *shorten* the duration of the crop very materially.

4. It frequently happens that some of the tendrils refuse to go up the rods, in which case they must be turned the *contrary* way to the sun's course; for if conducted in the opposite direction, they will turn again, and not go forward. This deviation from the common habits of plants is by some attempted to be thus accounted for:—The plant is a native of South America, which is in the southern hemisphere, and, although removed to the northern hemisphere, is still obedient to the course originally assigned it by its Maker.

b, Dwarf or French Bean.

1. Early Yellow Dwarf—Adapted for the first early crop
2. Early Black or Negro—Seed black
3. Early Red Speckled

These three varieties are the earliest and most hardy.

4. Early White—Rather later than the above, but of superior flavour.
5. Battersea
6. Canterbury White

Market Gardeners depend on these two varieties for main crops.

7. Black-speckled
8. Brown-speckled
9. Dun-coloured
10. Tawny
11. Streaked
12. Large White Dwarf

} All profitable sorts, and advantageous to the consumer.

Culture, &c.

Soil.

1. *For early crops* a light rich soil, rather sandy and dry.

2. *For late crops* a moist loam is more congenial.

Propagated by Seeds.

1. Sown in hot-beds from January till March: they should have but a moderate heat, much room, and as much air as can safely be admitted to the plants.

2. Sown thick in pots in April and May, and the pots plunged in a hot-bed; and when the beans are an inch or two high, transplanted in rows, in a warm border.—A fortnight is gained in their growth by this method.

3. The early kinds to be sown on a warm border in April; and all kinds in the open ground from May till August.

4. For forcing in the vinery or stove, Mr. Nicol first raises his plants in flower-pots, or shallow pans, and when about an inch high transplants them into twenty-four sized pots; each pot is *half filled* with *well rotted manure*, and a small quantity of light rich mould is placed on the surface; four plants are then put into each pot, and moderately watered for a few days, by which time they will have established themselves; flower-pans are now placed beneath the pots, and the subsequent waterings regulated by the quantity of water contained in the pans; it is of importance that the water should be sprinkled on the *surface of the mould*, and not *poured into the pans*. By adopting this mode of cultivation the plants are never infested or destroyed by insects, are always in a vigorous state, and bear most abundantly.

5. *For an early crop*, make the drills two feet apart, an inch and a half or two inches deep, dropping the beans in each row pretty closely together, about one or two inches apart, to allow for a failure which is sure to happen at this early season of the year.

6. *For later crops*, sow from one to two inches deep, and four inches asunder, the rows from two and a half to three feet apart.

7. In dry hot weather first water the drills, or soak the beans. To preserve the seed from too much wet in rainy weather, draw a drill, and plant alternately on each side.

8. A row forty feet in length, the beans from two and a half to three inches apart, will require a quarter of a pint of seed.

Plant.

1. To be early earthed up.

2. No beans should be gathered from plants intended to be reserved for seed, which should be of the best season; when ripe they should be pulled by the roots and hung to dry, before the seeds are threshed out.

Use.

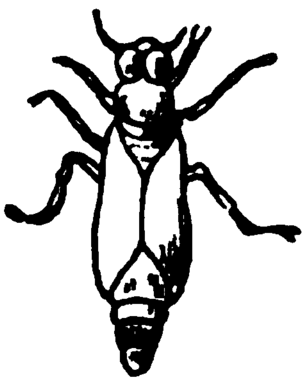
1. The unripe pods are the parts in request, and when boiled are very much esteemed at table.

2. The seeds, when dry, are much employed in soups on board foreign ships.

BEE.

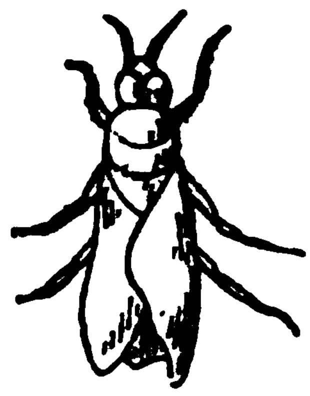
The Common Honey Bee (*Apis Mellifica*, Linn.).

Every association of bees comprise three descriptions of individuals.



1. *The Queen Bee*, distinguished by her majestic movements, great length of body, proportional shortness of her wings (which extend only half the length of her body), and her *bent sting*. Her colours, also, are much more distinct: the back is of a much brighter black; the concentric rings on the under side of her body are darker, and the lighter interstitial part of the same region appears of a brighter and more lively hue. The legs, also, are of a deep golden-yellow colour.

2. *The Working Bees*, distinguished by a peculiar structure of the legs and thighs, on the latter of which are small hollows or baskets, adapted to the reception of the propolis and farina which they collect; each is furnished with a long flexible proboscis, and armed with a *straight sting*. They are the smallest members of the community, and in a single hive their numbers vary from 12 to 20,000. Upon them devolves the whole labour of the colony; they rear the young, guard the entrances, elaborate the wax, collect and store the provision, and build the cells in which it is warehoused, as well as those that contain the brood.



3. *The Drones or Males*, distinguished by their having *no stings*, and their larger size; they are one-third larger than the workers, rather shorter than the queen, but much larger; they make a greater noise in flying, have a shorter proboscis, and are more blunt at the tail than either the queen or the workers; the last ring of the body is fringed with hairs, extending over the tail, and visible to the naked eye. Underneath the tail two small protuberances of a yellowish colour may be seen, which are regarded as the distinctive marks of their sex. In a single hive their numbers are estimated at from 1500 to 2000.

APIARY.

1. *Situation.*—The best and most promising situation for an apiary is the vicinity of woods and commons, and of running water, rather than of large lakes or rivers, in which the bees, when drinking, are often driven away and perish. A dry air and a light soil, productive of odoriferous shrubs, are likewise essential to the production of the best honey and the finest wax.

2. *Aspect.*—All apiarians agree that, in this country, the aspect should be more or less southerly, and that it should be well secured from the north and south-west by trees, high hedges, or other fences.

3. *Pasturage.*—Those who are desirous of profiting by their bees should plant, to a certain degree, for their provision; the following will be found well adapted for the purpose:—Dutch clover (*trifolium repens*),

buck wheat, heath, furze, broom, saintfoin, melilot, marsh-mallows, borage, thyme, lavender, sunflowers, hollyhocks, vetches, and all the cabbage tribe. Mignonette, if sown abundantly, is a plant of considerable importance to the apiary.

HIVES.

1. Bee-hives vary so much both in their form and construction, that, at first sight it would appear difficult to decide upon the best. The common straw hive, however, as if by common consent, obtains the precedence of all its competitors; it certainly possesses great advantages over those made of wood or other materials, from the effectual defence it affords against the extremes of heat in summer and cold in winter.

2. The best straw for constructing hives is that of *unblighted* rye; and *unthrashed* is preferable to thrashed straw.

3. The hive must be protected by a cap or roof of thatch, made also of *new* and *clean* rye straw, and considerable advantage will be obtained by renewing this covering at intervals of three or four months.

4. *The size of hives*, is of more importance than is generally imagined, for bees, from instinct alone, always endeavour to fill their hives with combs before they begin to collect honey; if, therefore, the hives are too large, much of their time will be spent in unprofitable labour, and starvation is the consequence. From this it is obvious, the hives should correspond as nearly as possible with that of the swarms. A full-sized straw hive will hold three pecks, and a small-sized from one and a half to two pecks.

5. The apiarian, if he be desirous of having glass windows in his straw hives, may easily accomplish this object, by cutting with a sharp knife through two of the bands of straw, in two places, about three inches asunder. The ends of the cut straw-bands may be secured by packthread, and the panes of glass may be fastened with putty. The windows are generally cut opposite the entrance and about the centre, but may be made in any part of the hive.

6. The common method of placing hives upon benches Mr. Huish considers as highly objectionable, from the dangerous and fatal quarrels to which it exposes the bees, and he therefore recommends placing every hive upon a single pedestal. By this means, when any thing happens to one hive, the others are less likely to be disturbed than when placed on a shelf in a bee-house. The pedestal, or stool, should have but a single leg or support, and its top, on which the hive is to stand, should be made of well-seasoned and substantial wood, which will not warp, and which should be firmly nailed to the post in a slanting direction, that the rain may run off.

7. The hives should be ranged in a *right line*, at two feet distances apart, and about the same distance from the ground. A bee taking flight from the hive generally forms in its ascent an angle with the horizon of about forty-five degrees, and should the hive stand at too great an elevation, the swarm would take so extensive a flight that it would never be able to return, to the loss of the proprietor. The back part of the hive should be fixed within half an inch or an inch of the pedestal, leaving in front a space of three or four inches, which is absolutely necessary as a landing-place on which the bees may alight. If the apiary should be so extensive as to require a double row of hives, the hinder ones should alternate with or be placed at such distances

from the front ones, as shewn in the annexed figure, that when the bees take their flight no obstruction is offered to their ascent.

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BEES.

1. *Removal and choice of.*—Michaelmas, or not long after, is the proper period for the removal of bees; or if deferred till the spring, not later than the beginning of March. As a criterion of a good hive, the straw should be fresh and sound. Internally, the middle comb, should be of a golden hue, or a pale yellow colour; if of a black colour it is the sign of age. If there be many queen cells, the hive is old and decaying. If the sides of the combs appear gnawed, it is an indication that the moths have got possession of the hive; of course the purchase must be rejected. There is this advantage in a spring purchase, that the bees may be seen at work; but, perhaps, the difficulty moving is greater than in the autumn. A loud humming and much bustle, and fresh exterior of the hive, are the best signs. A hive in February ought to weigh 15, or at least 12 lbs., in autumn 30 lbs.; but, if an old hive, the quantity of bee-bread or farina, the heaviest substance in the hive, will constitute too much of the weight; and so a useless raw material will be purchased instead of honey. The hive, when purchased, should be raised gently from the stool, some hours prior to its removal, and be supported by wedges, that the bees may not cluster on the floor, as this would be productive of inconvenience at the time of their removal. After being wedged up, the hive should remain undisturbed till night, when being placed upon a proper board, it should be carried away carefully and placed at once where it is intended to remain. The bees of a hive recently removed, if purchased of a near neighbour, or if the weather be cold, should be confined for a day or two, or else many of them, after flying about in quest of provision, will be lost; in the one case by returning to their old habitation, and in the other by being chilled to death in searching for their new one.

Swarming.—This may take place at any time between the beginning of April and the latter end of August. It seldom happens before ten in the morning, nor later than three in the afternoon; and never but in fine weather. The most advantageous time for a swarm to be thrown off, is from the middle of May to the middle of June. The sign of the approaching departure of a swarm is, the bees clustering and hanging about the exterior of the hive, calling each other with shrill notes, and the whole hive appears to be in a great commotion. The rising and departure of a swarm of bees, is a very curious and interesting spectacle; the first part of the swarm in quitting their native hive, make a a short flight, and then return, joining the great multitude, which ascends, parading and circling the expanse in thousands and tens of thousands. After this ceremony, attending their queen, the whole swarm departs for some contiguous domicile or resting place; if it quit the first place on which it clusters, it hovers in the air for some time, as if undetermined, and then flies off with great velocity. The departure of swarms must be watched efficiently throughout the whole day, or they will make their exit unseen, and may be totally lost. This seldom happens if they are duly followed, as they are unlikely to travel very far, and

generally alight upon a tree, or some accessible spot. They are said to fly at the rate of a mile in two minutes. The accustomed music of warming-pans and tongs upon this occasion, is an ancient fallacy of no kind of use; or it was, perhaps, originally practised to announce the proprietor's title to the swarm, which he had a right to follow into other persons' grounds.

3. *Hiving.*—It is always desirable to have swarms put into new hives, as old ones often contain the larvæ of moths, and other embryo insects, which may prove injurious to the bees; every rough straw should be removed from the interior of the hive, otherwise the bees will lose that time in rendering it smooth, which they could employ to greater advantage in gathering honey, and constructing their combs. Two new sticks, placed across each other, at the second round of straw from the bottom of the hive, will be useful to support the superincumbent weight of combs. Dressing the insides of the hives is of doubtful advantage. Some people rub the interior of the hive with balm, bean-tops, fennel, &c. or smear it over with cream and honey. Wildman strongly reprobates this practice, as it gives the bees the trouble of making the hives clean again. If any thing be used in compliance with custom, sugared or honeyed ale is the most alluring. The swarm being overtaken, should be hived with all possible expedition, least they should take a second flight. The hive should always, if possible, be put under the swarm, and the bees shaken or brushed into it, with a goose wing or bough. The hive is then to be covered with a sheet or table cloth, and placed contiguous to the parent stock, to catch stragglers on their return home. At night it should be removed to its permanent station; the branch on which the swarm settled is sometimes rubbed with wormwood, or smoked with disagreeable fumes, to drive away all remaining loiterers. Should symptoms of discontent be observed after hiving, the queen will probably be discovered on the ground, or somewhere apart, surrounded by a small cluster of attendants, whom nothing but violence can separate from her. If she be taken up, either singly or with the cluster, and placed near the entrance of the hive containing the swarm, all will be harmony.

Sometimes a swarm divides into two portions, which settle apart from each other, and have each a distinct leader. The conduct of the apiarian must be governed by the two divisions, and the season at which they emerge; unless both be large, and the swarming early, they had better be hived in separate hives. The junction is easily effected, by inverting, at night, the hive in which they are, and placing over it the one it is intended they should enter; they soon ascend, and apparently (as has been observed by Dr. Harrison) with no opposition from their former possessors.

4. *Taking the honey.*—It is the usual custom in this country, to sacrifice the lives of the bees in order to get possession of their stores. This is generally done in September, by setting the hive, late in an evening, over lighted brimstone matches, placed in a hole dug in the earth; the soil being quickly drawn round the hive, as well to prevent the escape of any of the bees, as to confine the sulphurous gas. In about a quarter of an hour, if the hive receive a few smart strokes on its sides, the bees will be found to have dropped insensible into the hole, where they are immediately buried to prevent resuscitation; such a

death seems one of the easiest both to the insects themselves and to the human feelings. Indeed, the mere deprivation of life to animals not endowed with sentiment or reflection, is reduced to the precise pain of the moment, without reference to the past or the future; and as each pulsation of this pain increases in effect on the one hand, so on the other the susceptibility of feeling it diminishes. Civilized man is the only animal to whom death has terrors; and hence the origin of that false humanity, which condemns the killing of bees in order to obtain their honey; but which might, with as much justice, be applied to the destruction of almost any other animal used in domestic economy, as fowls, game, fish, cattle, &c. Much has been said about the cruelty of killing bees; but if man is entitled to deprive them, either totally or partially of their food, he has an equal right (and in truth by that very act exercises it), of depriving them of their lives. For of the hives that have been partially or wholly deprived of their honey, it may be safely affirmed, that there is not one in ten that does any good. If they live till the succeeding spring, they are commonly too weak to collect food, or to breed, and, being plundered by their neighbours, dwindle away, till at last the hive is without inhabitants. A prompt death is surely preferable to one so protracted.—(*Loud. Agric.*)

5. *Feeding Bees.*—A stock of bees will, generally, consume a pound of honey per month, betwixt the 1st of October and the 1st of March; from this time to the end of May, they will consume two pounds per month; if the spring be unfavourable for gathering early, and less than ten pounds of honey per stock have been left for their winter support, and that winter proved mild, the bees should be fed early in the season, and sometimes through a considerable part of the month of May. The best spring food for bees (according to Mr. Bevan), is the following compound:—a pound of coarse brown sugar, and half a pint of ale or sweet wort, is to be boiled to the consistence of syrup, to which may be added a small portion of salt. According to Huber, the coarsest sugar enables the bees to form the whitest wax. The above mixture is regarded by some as a useful food for bees, even when there is no deficiency of honey. It is supposed to encourage early breeding, and to preserve the health of the bees. Mr. Bevan invariably administers it from the end of February, or the beginning of March, till the bees seem to disregard it, which always happens as soon as the flowers afford them a supply of honey. With respect to the best mode of administering the food or syrup, two opinions prevail; one party gives the preference to *daily feeding in small quantities*, the other to introducing a *considerable quantity at once*, and repeating it as occasion may require. The majority of apiarians favour the latter practice. Copious feeding is effected by filling the cells on one side of a spare drone comb, laid flat upon the floor of the hive; or by pouring the syrup into a dish, or an excavated floor-board of twice the usual thickness, covering the food with short straws or pieces of reed, about half an inch long, to prevent the bees from soiling themselves. The stock being placed in an evening over the whole, in the course of the night, or the following morning, the bees will carry up the syrup, and store it in unoccupied cells. Where it has been ascertained that the bees have not stored a sufficient quantity of honey to carry them through the winter and ensuing spring, then *copious feeding*, according to Mr. Bevan, is the best; but when they are fed in the spring, he thinks it preferable to give them about a table

spoonful every day. This is accomplished by introducing into the mouth of the hive a long boat, formed by scooping out the pith from an elder stem, and filling it with the composition. Upon this plan, no more is introduced than the case requires, and frequent opportunities are afforded of learning the condition of the bees.

6. *To protect hives from the cold*, they are covered with straw or rushes, about the end of September, or later, according to the climate and season. This is an essential business, as well-covered hives always prosper better the following season, than such as have not been covered. In October, the aperture at which the bees enter should generally be narrowed, so as only one bee may pass at a time. Indeed, as a very small portion of air is necessary for bees in their torpid state, it were better during severe frosts, to be entirely shut up, as numbers of them are often lost, from being enticed to quit their hives by the sunshine of a winter's day. It will, however, be sometimes proper to remove, by a crooked wire, or similar instrument, the dead bees and other filth, which the living, at this season, are unable to perform of themselves.

7. *Diseases of Bees.*—The chief diseases of bees, generally arising from damps, cold, or poverty, and occasionally from the excessive heat of the sun, when shelter is necessary for the hive—are dysentery or looseness, torpor, falling in flight from vertigo or giddiness, and vermin. Care and good feeding seem to be the only remedies on which much dependance can be placed. Good old red-port mixed with honey, and toast soaked in old beer, are the chief specifics in repute.

8. *Enemies of Bees.*—The principal enemies of bees, are ants, moths, wasps, and spiders; of these the moth and the ant are the most destructive. Many birds, also, not mentioned before, including the tom-tit and sparrow, are bee killers, with which may be joined the toad. The chief difficulty lies with the moth, the ant, and the wasp, in autumn. When the moth has obtained a considerable footing, the bees will quit their hives. The prey of the moth is supposed to be the pollen or bee bread, in store, and the heterogeneous refuse attached to the wax. A timely renewal of hives seems to be the only certain remedy—to join the bees to another hive, and save the little left by the depredators. The too fatal sign, according to Huish, of a hive taken possession of by the moth, is an inaction of the bees during ten days or a fortnight, whilst the bees of other hives are in activity. The ascent of ants may be prevented by tarring the lower part of the hive pedestals, and constantly repeating it when too dry.

It should be a rule invariably to be observed by the apiarian, never to expose his hands or face unnecessarily to the attacks of the bee during the operations of hiving or swarming; but, in all cases, he should be provided with a proper dress to obviate so serious an inconvenience. In some instances, the *sting of the bee* gives rise to great pain and even severe inflammation; in such a case, the *best application* is *opium* and *olive oil; one drachm* of the former, *finely powdered*, to be rubbed down with an *ounce* of the latter, and applied to the part affected by means of lint, which should be frequently renewed.

BEECH.

The Beech (*Fágus Sylvática*), Monæ'cia Polyándria, Linn.; Amentáceæ, Juss.

Culture, &c.

SOIL.

1. Thrives best in chalky flinty soils, and in dry sandy bottoms.

2. Prefers sheltered situations, but not exposed to the west; the declivities of hills facing the east or south are its favourite situations.

PROPAGATED.

1. By seeds, to be sown as soon as ripe. It is recommended to keep the seeds dry in sand, till the month of March or April, and then sowing them; the beginning of April, however, is considered as good a time as any.

2. Two or three bushels are sufficient for an acre, to be sown mixed with sand, in the same manner as directed for the ash.—See ASH.

TREE.

1. A handsome umbrageous tree with a smooth bark, and shining leaves, which remain during winter in a dry state on the branches, and are very long in decaying after their fall. Hence they form a thick bed through which grasses and herbaceous plants in general do not readily penetrate. It is a free grower; and therefore injures oak if planted with it. Nothing but holly will grow under its drip. There are several inferior varieties.

2. The trees to be planted at very little more, if any, than four feet apart in the plantation.

3. The Beech ought never to be planted as underwood, except for fuel, it being, in that state, unfit for poles, stakes, hoops, &c. The plantations, therefore, must not be too thick, as the wood is of very little use till it attains a considerable size. If the trees are planted out at four or five feet apart, they may be thinned as they grow larger, so as to be left at least from ten to twenty feet apart. In this state the Beech grows to a considerable height, and forms most beautiful wood, especially where the land is of a chalky nature, or where there is a dry sandy bottom.

4. Beeches, and indeed all trees that are not intended for underwood, should have their bottom side-shoots carefully pruned, cutting them close to their stem, with a sharp knife. This ought to be done in autumn, after the fourth summer's growth; cutting off the lower side-shoots, and leaving those of the last three years: and this ought to be continued till a clear stem is produced, of the desired length.

5. The Beech is always felled in winter, or at least when the leaf is off.

6. A Beech at the age of sixty was found to contain 100 feet of timber; and was calculated to contain 212 feet in twenty-four years after; that is, more in the last twenty-four years than the sixty preceding. The wood is brittle, but close grained, and of a firm texture.

USE.

1. The leaves gathered in autumn, before they are much injured by the frost, are said to make better mattresses than straw or chaff, and will last seven or eight years; they are also profitably employed in forcing sea kale, asparagus, and hot-beds.

2. The wood is formed into tool handles, planes, chairs, bedsteads, bowls, large screws, &c. and is generally chosen for dressers, and shelves in milk-houses, for churns, cheese vats, and the like; it being as white as deal, free from all disagreeable smell, and without any inconvenient softness.

3. The nuts, termed *beech-mast*, are the food of hogs, and of various small wild quadrupeds. By pressure they yield a sweet oil, available for many useful purposes; roasted, they have been used as a substitute for coffee.

4. The tree bears lopping, and may therefore be trained to form very lofty hedges.

BEET.

Beet (*Béta*), Pentándria Digy'nia, Lin.; and Chenopódeæ, Juss.

The genus Beta comprises several biennial species, of which the two following are in general cultivation:—

1. Red Beet (*Béta vulgáris.*)
2. White Beet (*Béta Cícla*).

Of the Red Beet, Mr. Morgan enumerates the following varieties (Hort. Trans. vol. iii.)

1. *Large-rooted Red Beet.*—The root of this species usually grows more than half out of the ground.

2. *Long-rooted Beet.*—This variety is sweet, but sometimes earthy, and is very apt to be stringy, and therefore not so worthy of cultivation as some others.

3. *Dwarf Red Beet.*—This variety is most cultivated at the Royal Gardens, at Kew; it boils of a deep pink, is tender, and perfectly free from all stringiness.

4. *Turnip-rooted Red Beet.*—The root of this variety grows principally within the earth, the diameter at the top is near five inches, and it is not more in length, tapering very suddenly, and throwing out a few strong fibres, but no fangs. The roots boil of a pink colour, are coarse in appearance, but early in the season are certainly better flavoured than the other kinds; they are tender, and free from fibres.

5. *Petite Betterave Rouge.*—This is described as of considerable value; the root grows entirely within the ground, and at its widest part is little more than two inches in diameter, and is shaped much like a carrot of that dimension; it grows regularly, has no fangs, but only fibres; the flesh of the root is of a much deeper crimson than that of any yet noticed; it boils of a deep colour, and is very tender and delicate.

6. *Betterave Rouge de Castlemandari.*—The root of this variety is little more than two inches in diameter at the top, tapering gradually to the length of nine inches; it is of a deep purple colour, which it preserves when boiled; it is very tender and sweet, and looks delicate when sliced.

7. *Green-topped Red Beet.*—Much grown in Scotland; in growth and habit it resembles the Dwarf Red Beet; its leaves are green, not bright, but rather a dull purplish green.

The intensity of colour in the red beet varies considerably, and the foliage is equally liable to shew differences; but these variations must be considered as deviations from the true sorts.

Of the above varieties the three following are generally chosen for cultivation:—

1. *The long-rooted.*—Which should be sown in a deep sandy soil.
2. *The short or turnip-rooted.*—Better adapted to a shallow soil.
3. *The green-leaved, red-rooted.*—Requiring a depth of soil equal to that for the long-rooted.

Culture, &c.

Soil.

All the varieties require a deep rich soil, to prevent their growing forked; the ground should be very fine, rather sandy and dry, rich and mellow, but by no means manured with fresh rank dung.

Propagated.

1. By seeds, which should be sown about the middle or latter end of March, or early in April, if designed for autumnal use; but in the beginning of May, if intended to come in the next spring. The ground should be manured with light sandy compost: this should be done a month or two before sowing, digging the ground deeply, breaking every clod, and rendering it as fine as possible. At the time of

sowing, the beds should be set out according to the number of rows required: a space being dug for the first row, the ground should again be made perfectly fine; the line should be stretched, and an even drill drawn with the point of the hoe, about an inch and a half deep, the seeds are then to be dropped either at regular distances of eight or ten inches apart, in the drill, or about two inches apart all along the drill, then drawing the earth with the hoe raised back again over the seeds, and pressing it down firm and hard with the spade. Proceeding thus, digging and making rows, one foot apart for the smaller sorts, and eighteen inches for the long-rooted:—three or four rows will be sufficient for one bed. The edges of the bed are to be cut smoothly by the line; each edge to be at least nine inches from the outermost drill; and then forming little foot-paths on each side of the beds. When the plants come up and make some little progress, they should be thinned out, so as to leave only one of the strongest in each spot, or eight or ten inches apart.

2. Beet may be transplanted, but the operation certainly reduces the size of the root.

3. In the subsequent culture, the rows should be kept free from weeds by flat hoeing between the drills.

4. Before the winter they must be taken out of the ground, and *great care taken not to injure the roots*, as they bleed very much on the slightest bruise, losing their colour when boiled, and becoming very insipid to the taste, on which account the leaves should be trimmed only, and not be cut off, as is usually practised. The roots may be preserved during winter in dry sand, after the manner of turnips and carrots.

5. As all the varieties sport extremely, particular care will be required in the selections of sorts, from whence seed are to be saved; these must be carefully chosen and planted out separately in the succeeding spring, when they will throw up their flowering stems, and bear an abundant crop of seed.

USE.

The roots, to be rendered easy of digestion, should be boiled till perfectly tender, when they may be eaten as a dinner vegetable; or, they may be sliced and used with salad: they form a beautiful garnish, and are very much used as a pickle.

Culture, &c. of the White Beet.

The varieties of the Beta Cicla should be sown late in the spring, and must have a rich soil to enable them the leave large and good. They require no particular care, except that of being kept sufficiently thin and distant from each other in the bed. What has been stated with respect to the management of the red beet applies equally to the white beet. Those plants that remain over the winter, to produce early leaves in the spring, before they shoot up their flowering stems, must be protected from frost by some light covering.

USE.

1. The white beet is cultivated in gardens entirely for its leaves, which are boiled as spinage, or put into soups. The stalks of the leaves when pealed, are also used for culinary purposes; they are usually boiled and served up in the manner of asparagus or sea kale. The variety called Mangold Wurzel, is reckoned a valuable agricultural plant for feeding cattle. See *Mangold Wurzel*.

2. It is from the roots of this species, that the French and Germans obtained sugar with so much success during the late war. The following process is given by Mr. Samuel Taylor, (*Loudon's Gard. Mag.* April, 1830.)

PROCESS OF SUGAR MAKING.

"The roots should be first washed and then rasped, to reduce them to a state of pulp. Of course, in large manufactories, they are provided with rasping machines; and it is somewhat difficult to find a substitute on a small scale. I should imagine though, that a stout iron plate, punched with triangular holes, the rough edges of which are left standing, somewhat after the manner of a nutmeg grater, might answer the purpose, only that I would have it somewhat concave instead of convex. Upon the rough side of this plate I would rub the roots by hand. If there should be a cider mill and press within a reasonable distance, it might answer to take the roots thither, slice them, and pass them through the mill. When by these or any other means they are reduced to pulp, the juice should be pressed from the pulp, which is thus done:—It is put into canvass bags, not too fine, so as to impede the running of the juice, nor yet so coarse as to let the pulp through the meshes. The bags should be so fitted, as when pressed, to occupy about an inch in depth. Most manufactories use about twenty-five of these bags at one pressing, but this depends on the power of the press. Between every bag of pulp is laid a sort of osier hurdle, to allow the juice to percolate freely from the press into the juice cistern below. The operation of pressing should immediately follow that of rasping. This point should be particularly attended to.

"*Defecation.*—The juice being expressed from the pulp, the next process is the defecation of the juice, and here, too, no time should be lost. This is effected by boiling: a copper boiler should be used. Get up the fire till the thermometer indicates 176 or 178 deg. Then add sifted lime (quick) previously mixed with water, at the rate of five or six pounds for every one hundred gallons of juice. Stir it well up, and skim the liquor. Heat it till the thermometer reaches 200 deg. Add sulphuric acid in small portions, diluted with six times its bulk of water, to neutralize the effect of the lime, stirring it briskly each time. The proper quantity is ascertained by carefully examining the juice every time the acid is added, with a drop of syrup of violets in a spoon, which ought to turn of a green colour. About thirty ounces of the acid to every one hundred gallons of juice will be necessary. This done, the fire is quenched, and the boiler left to settle for half an hour; at the end of which time, the liquor is drawn off: by some, bullock's blood is added when the temperature of the juice reaches 190 deg., in the proportion of two and a half pints to every twenty gallons of juice. Some, too, apply the sulphuric acid to the juice when cold, instead of hot, viz. before the boiler fire is lighted; and one recommends its being applied to the pulp before it goes into the boiler: but all this, practice will decide.

"*Concentration.*—The next process is concentration of the juice, which means nothing more than evaporating from it the water therein contained. This is effected by flat pans over a brisk fire, but not so as to burn the syrup, which is the great danger in this operation. When reduced in pan (1) from four to two inches, or so in depth, it is put into a smaller pan (2) and reduced to the same depth, and afterwards into a third pan. These three removals are the work of an hour and a half. If the syrup rises, and threatens to overflow the pan, put in a small lump of butter, which will make it subside.

"*Clarification.*—This is the next operation, and may be carried on in one of the pans used for concentration. Animal charcoal (some have even used wood charcoal) is now applied, at the rate of half a pound for every gallon of syrup, which renders it perfectly black and muddy. In this state, add blood mixed with water (stirred up well with the syrup), in the proportion of about one pint and a half of blood to every twenty gallons of syrup.

"Boil it a short time, after which it is filtered, and then boiled again, care being taken not to burn the pan. Great care is necessary in examining the state of the syrup from time to time. The thermometer ought to stand as high as 234 deg.; on attaining which, the pan should be emptied. Eighteen gallons of syrup will be reduced, by boiling, to eleven gallons. The syrup is next cooled in a suitable vessel to 182 or 190 deg. and then run into moulds, but the cooling is very gradual. The pan is covered and the heat kept in by closing the edges with flannel. The syrup is then poured into large earthen moulds cone shaped, and with a hole at bottom, through which the molasses drains. The hole is temporarily stopped till the mould is full. A mould contains ten or twelve gallons, and requires a month to purge itself. As it cools it crystalises. The syrup, whilst filling, is at 67 to 77 deg.; but, in the course of purging, it is raised to 120 and even 145 deg. which expedites the flow of the molasses. Our next process is *turning the moulds*, i. e. setting the cones on their bases, and taking them out of the moulds. The point of the cone is moist and syrupy: this is cut off, and boiled over again with the molasses. Thus far the process of making brown sugar: refining is a different business, and one which there is no occasion to particularise here. You will observe that copper utensils are preferred to those of iron, the latter having a chemical effect on the sugar.

"I have thus endeavoured to present you with the leading features of the system of sugar making adopted in France, though I am aware that much yet remains to be told on this interesting subject. In fact, the experience of every year keeps adding to the general stock of knowledge thereon, and one main source of improvement consists in the application of

steam to the evaporating process. However, as this would be of no use to cottagers, I have confined myself entirely to the plain common method by open fires.

"From what has been said, you will observe that the process is neither very easy nor very simple. On the contrary, it requires great attention and accurate descrimination. Still, I am of opinion that a clever intelligent cottager, even without the aid of chemistry, may succeed in making sugar for his own use, albeit not of the very first quality."

BIRCH.

Birch *(Bétula)*, Monœ'cia Polyándria, Linn; and Amentàcea, Juss.

1. Common Birch, Bétula álba.
2. The American Birch, or Cherry Birch of Canada } Bétula lénta. } These varieties are not generally cultivated.
3. Poplar Birch, Bétula populifólia. }

Culture, &c. of the Common Birch.

SOIL.

Will grow in any soil, but best in shady places. It will flourish on a bank of pure sand or gravel; also, in swampy places.

PROPAGATED.

1. *By seeds*, which are easily taken from bearing trees, by cutting the branches before they are quite ripe in August: they may be thrashed out like corn, as soon as the branches dry a little.

2. A great deal of nicety and attention is required in rearing the birch from the seed; they must be sown in the shade, and covered very lightly with soil made as fine as possible, and watered according to the wetness or dryness of the season; yet with every precaution (Mr. Cobbett says) he could not obtain more than one plant in a square yard. "Reflecting on the cause of this failure, I determined," says he, "to try some seed *on the top of the ground, and under shade.* In order to insure the shade and moisture, and at the same time to insure protection against heavy rains, and gusts of wind, I prepared some ground, on which I put cucumber frames; and in these frames, the bed of earth having been sifted very finely, I sowed my seed in the following manner:—I first put it into *warm water*, and let it soak for forty-eight hours: I then mixed it well and truly with earth very finely sifted, making the whole rather wet. I laid the mixture in a heap, which I turned every day for four or five days, until I saw here and there a seed beginning to throw out its root. I then took the mixture (seed and earth together), and scattered it on the beds that I had prepared, gently watering the bed, and shading it with a mat, giving air in the day-time, and, when no rain or wind threatened, taking off all covering during night. In about a week, I saw the seeds, which lay on the top of the ground, beginning to send out their roots, and to send them down into the ground: as the root descended, the seed rose up from the ground; and at the end of about four days, it was most curious, and, to me, most delightful, to behold the whole bed, covered with little brown seeds standing up sustained by the root: in about four days more the leaves 'shuffled off the mortal coil,' and the bed was all one beautiful green. It was pretty nearly *July* before I resorted to this method, so that the plants were still very small when overtaken by *autumn*, and of course too small for sale this year; but by one transplanting they will be made very fine plants. After the plants become green, you must still continue to shade under a hot sun, until they be fairly out in rough leaf;

but when they arrive at that point they are safe. Here is a great deal of nicety and attention required: but consider, a cucumber frame, of three or four lights, will give you from *ten to twenty thousand trees*, with as much certainty as you can have any plant of any kind. For the want of knowing how to manage the seed-beds of this tree, recourse is had to the coppices; and I venture to say, that one thousand plants obtained in that way must, on an average of cases, cost as much as raising ten thousand in the manner above directed; besides that the plants from the coppices must necessarily be poor scrubby things, compared with those raised in beds."

3. From the seed-beds, the plants should go into the nursery, where they are treated in every respect the same as recommended under the article *Ash*.

4. *The planting out* of this tree is likewise performed in the same manner as in the ash; but four feet each way is quite thick enough, and the produce, if the plantation be duly attended to, is very great: for the shoots of the birch grow erect; great numbers come out of a stem; they grow very fast; and they suffer from nothing but actually cropping or breaking off.

TREE.

1. The wood is firm, tough, and white.
2. If planted for underwood, it should be felled before March to prevent its bleeding.
3. Bears removing with safety, after it has attained the height of six or seven feet.
4. Is ready to plash as hedges in four years after planting.

USE.

The most general and the most profitable use to which birch at present can be turned, is, unquestionably, the manufacture of small casks, as herring-barrels, butter-casks, &c.: for the latter purpose it is admirably adapted, because it is stout, clean, and easily wrought, and communicates no peculiar taste or smell to the butter.

2. The bark is applied to many purposes—for tanning leather, covering roofs, and constructing light canoes; and also, as is believed, for yielding the essential oil which is used in tanning Russian leather, and to which it owes its peculiar and highly-valued odour.

3. The timber of the birch was more used and more valued in former times. It was not so strong as the ash for harrows and other farming implements, but it was not so ready to split, and for roofing cottages it is still in estimation, being also the wood generally preferred for making clog-soles, to be worn in the place of shoes. The branches being cut off, and the twigs separated, these are made into brooms. The whole tree is adapted for burning into charcoal of the best quality, and even the sap has been drawn out in spring, and made into wine.

BORAGE.

Borage (*Borágo Officinális*), Pentándria Monogy'nia Linn.; and Boragíneæ, Juss.

This is an indigenous plant, of easy culture; its flowers which are of a lively blue colour, have a very pretty appearance, blowing for several months together.

Culture, &c.

SOIL.

Prefers a light dry soil, but will grow in any soil or situation.

PROPAGATED.

By seeds, sown any time from February to May, either broad-cast and raked in, or in small drills from six to twelve inches asunder; when

the plants are fairly up they must be thinned to twelve inches apart, for although the plant will grow when transplanted, it succeeds best when left to remain where sown. If the young leafy tops and flowers are the parts in demand, the stem must be permitted to run up.

USE.

1. The young and tender tops are used to furnish boiled dishes in summer and autumn, and occasionally as salad.

2. The roots are sometimes employed for culinary purposes during the winter season, in place of salsify and scorzonera.

3. The spikes of the flowers form an ingredient in negus, and cool tankards, and the blossoms are occasionally employed as a garnish.

4. This plant was formerly in high repute as a cordial herb, for curing a complaint now very prevalent in this country, that is "*Sorrow*:" would that it retained its virtues at the present day! then, indeed, would it prove a valuable acquisition to every garden.

BORECOLE.

Borecole or Scotch Kale (*Brássica Olerácea*), Tetradynámia Siliquósa, Linn.; and Crucíferæ, Juss.

1. Green Borecole or Scotch Kale.
2. Purple or Brown Kale.
3. German Kale, or Curdies, a variety of the Green, from which it differs in affording a greater abundance of sprouts after the crown has been cut, it is also rather hardier and somewhat more bitter.
4. Egyptian Kale.
5. Jerusalem Kale.
6. Ragged Jack.
7. Woburn or Perennial Kale.

There are several sub-varieties which might be enumerated, but being objects of curiosity, rather than of utility, they are not inserted. The first three sorts are the most valuable, and almost universally preferred; the three next in order are dwarf stemless plants, capable of resisting the effects of the hardiest frosts, and therefore eligible for a late supply; the last is a hardy perennial of easy culture, and recommended by Mr. Sinclair as peculiarly adapted for farms and cottage gardens.

Culture, &c.

PLANT.

1. *Propagation.*—All the sorts (except the last) are propagated by seed, sown the last fortnight in March, in April, and the beginning of May: the best time for the main crop is the first week in April. For a seed bed, four feet by ten, one ounce of seed will be required.

2. *Transplanting and subsequent culture.*—When the plants are come up about an inch and a half high, the strongest plants must be drawn out of the seed bed, and pricked out into other beds, five or six inches apart, well watered, and must remain in this situation four or five weeks, when they will be sufficiently strong for finally transplanting in May, and thence to August. In transplanting always be guided by the weather rather than the season, taking advantage of showers, if possible. These should be planted in open compartments, in rows two feet and a half asunder, for the first summer's planting, and the latter crops two feet, and so on; setting the rows nearer each other as the season advances. They must be watered immediately after planting, to settle the earth to the roots, and the watering continued in dry weather. In order to employ land to the best advantage, plant between the rows of early beans and potatoes, which are ready to be cleared from the ground by the time the plants require to be hoed up. When the beans and potatoes are ripe, gather the crop and dig over the spaces between

the plants, that is where the former crops stood, and place the soil about the stems as much as possible. This practice is found to answer well, by which means an extra crop is obtained. The ground between the rows should be hoed over once or twice, in order to destroy the weeds as well as to draw the earth about their stems, to encourage their growth in the production of large full heads in the autumn and winter months. Some of the plants may be taken out of the ground in October, being careful to preserve as much earth about the roots as possible, and taking off all the lower leaves, immediately replant them in a sloping direction, about eighteen inches distance, covering their stems quite to their leaves; by this means, the crowns of the plants will be close to the ground, and when snow falls they will sooner be covered from the severity of the frost, and thus be preserved over the winter until spring. When all danger of frost is over, set them erect, by taking hold of their heads, and drawing them straight, and fastening them with the foot; they will afterwards sprout out from the top to the bottom of the stem.

USE.

1. As a culinary vegetable the borecole is greatly esteemed; it is extremely hardy, and capable of resisting almost the severest cold.

2. The hearts and sprouts are the parts eaten, which are never gathered till after they have been frozen, when they boil very green and tender, and eat extremely sweet and nice.

Culture, &c. of the Woburn Perennial Kale.

PROPAGATED.

By cuttings of six or seven inches in length, made in March or April, and planted where they are finally to remain; they readily take root, and in their subsequent culture require only to be cut down in the spring (about the beginning of April) to within two buds of the roots; the soil is then to be lightly forked over, and afterwards kept clean of weeds by the hoe.

BOTANY.

CHAPTER I.—*On the Advantages and the Pleasures connected with the Study of Botany. What is Botany?*

Every one must be convinced, that, considering the capabilities of man in reference to enjoyment, one important part of the business of life, is to ENJOY THE BEAUTIES OF NATURE. No one, it is hoped, exists but who has experienced connected with beholding a fertile valley and a well-wooded plain, a fertilizing river and the wide-expanding ocean, a morning's dawn and an evening's shade, the gay frolics of the happy tenants of the field, and the rapid movements of the inhabitants of the air,—the most intense, and, at the same time, the most pleasurable enjoyment. Indeed, there are many generous spirits who KNOW that the acquisition of wealth is not the sum total of the benefits of existence. With the soul that imagines the contrary, no elevated mind can have any sympathy. Conceive what a wide field of interest the creation opens up. A man who is acquainted with the truths taught therein, reads a lesson in every flower and gains pleasure from every plant. His stock of knowledge becomes enlarged, and equally extended is the sphere of his benevolence.

The quiet stillness and peacefulness of nature very often let fall the mantle of peace, like the prophet's of old, upon those who are pupils in the school of creation.

But how extensive is the study of nature! How numerous are the branches of natural knowledge or *science!* All cannot pursue them. Most must in the present state of society be content to gather the fruits from one or two. It therefore becomes important to select one which is most intimately connected with us, and which has the greatest likelihood to increase our happiness and augment the means of doing good. BOTANY or *the knowledge or science of plants* is that which has been chosen, because the Agriculturist has abundant opportunities of pursuing the same, and because, in its pursuit, much beneficial knowledge may be gained.

There is a pleasure in being able to give even the *name* of a plant: for who has not his associations connected with the flowers of the field? The oak reminds us of strength and flatters our self-esteem; for we talk of the "British hearts of oak." The yew-tree induces a quiet and pensive state of mind: and why? because it stands in the church-yard beside some kind schoolfellow or playmate's grave. The aspen-leaf by its constant shaking is an object of interest to many. The lily is to most an emblem of innocence; the rose, of virgin beauty; and who has not felt pleasure in seeing that sweet little flower, "Forget-me-not." Dead indeed must be that spirit who has never felt his heart beat high with enjoyment on the contemplation of such objects as these. But Botany extends our knowledge of such objects, and surely Botany must be a pleasing study.

But Botany has a still higher direction in which it becomes a source of delight to the mind of man. It needs scarcely to be intimated that man has a Creator, and that happiness consists in communion with the Most High. Botany is a kind of ladder to God: for all may

"Look through nature up to nature's God."

To turn, however, to another point, namely, the *usefulness* of Botany, more particularly in reference to the Agriculturist. In another part of this work it will be seen how important it is to be able to detect the different poisonous plants, which grow so abundantly in our meadows: an ability to be obtained to any advantageous extent only by a knowledge of Botany. The great Linnæus detected the cause of a severe disease among the horned cattle of the north of Lapland by his botanical knowledge, and performed by the aid of his acquaintance with the nature of plants, the most important services to his country. The bread-fruit, a vegetable of the highest importance, is now transplanted to and cultivated in our West India Colonies, and this has been effected by a botanist. For how many of our finest vegetables are we indebted to Botanists? Consider what an immense variety of vegetable substances supplies our wants and even our luxuries. The last year has, under the direction of a scientific botanist, Mr. Houlton, added one more excellent vegetable* to the rich abundance already possessed. A farmer was the first who observed the use of the spurred-rye medicinally. Indeed, many instances might be afforded of the uses of botany; but the best place for enumerating these will be in the following pages.

Botany, be it remembered, is not a *mere knowledge of names:* it is an

* The silver Ceres medal of the Society of Arts, was voted to Mr. Houlton for the introduction of the Stachys palustris, or March All-heal, the root of which when wild is crisp, dry, and fibrous.

acquaintance with the habits, the modes of growth, the peculiarities, and the uses of plants. It is necessary for the botanist to have a knowledge of the names of plants for the purposes of communicating and treasuring up his knowledge: but these names are to plants only as files to our papers, namely, to attach them to.

In fact, utility, in its widest sense, is the great recommendation of Botany, and as being useful, and also as combining pleasure with use, it is hoped that all will enter upon the pursuit of it with diligence.

CHAPTER II.—*On Vegetable Physiology, and the different Conditions of the Plant necessary to and connected with the Reproduction of the Species.*

The Creator has made a large establishment, which men call the UNIVERSE, the part in that universe more peculiarly appropriated to human beings being named the *earth;* for which, as well as for other parts of his great empire, He, like a wise Master, has appointed REGULATIONS for the purpose of producing that beauty, order, and harmony, which are found so conspicuously to prevail throughout. These regulations are called by philosophers the LAWS OF NATURE: and the SCIENCES truly so called are nothing more or less than the collections of these laws, which have been discovered by patient and long-continued observation. Those sciences relating to the existence of bodies having *life* come under the head of what is called PHYSIOLOGY, and that branch of physiology which refers to the existence of vegetables is called VEGETABLE PHYSIOLOGY.

Vegetable Physiology, therefore, as unfolding to us all those circumstances which relate to the existence, the preservation, the propagation, the uses, and the peculiarities of vegetable substances must be interesting and useful, and consequently well-worthy of the attention that is now to be bestowed upon it.

It may be advisable to notice that every thing the Creator has made is called a *natural object.* Natural objects are very numerous, and for the purpose of convenience, and also from the wide differences existing between some and the general likeness between others, are arranged under three kingdoms, the MINERAL, the VEGETABLE, and the ANIMAL. The first embraces all bodies that have *no* life, and hence have no particular duties or functions connected with life to perform. These, therefore, possess no *organs* (parts having duties to perform), and hence are said to be inorganic. The two others, namely, vegetable and animal substances, embrace objects that have life, and consequently have parts which have to perform the duties connected with life, or organs, and hence these bodies are said to be organic.

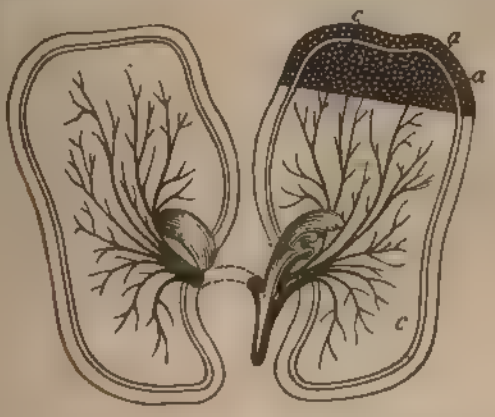
Between inorganised matter as comprehending minerals, and organised as comprising vegetable and animal substances, there is no difficulty in drawing the distinctions: and most are well aware of the general distinctions existing between vegetables and animals, though both these, be it remembered, agree in having life.

Vegetable physiology therefore embraces a knowledge of all the circumstances connected with vegetable existence; and in considering these the *Seed* will be that with which we wish to commence.

Section 1.—On the Seed.—Its structure—its changes. Germination —circumstances necessary thereto—Heat, Moisture, Air. Parasites —the means for the preservation and propagation of Seeds.

As the seed is the part from which all other parts of the plant are directly derived, it may be chosen as the subject first to be noticed.

A broad bean may be taken as an example of a seed. If it be soaked in water a little time, the following parts may be detected: the skins, or membranes, covering the seed, the outer of which is called the testa, the inner the membrana, well exhibited in the mace that covers the nutmeg; a scar on the outer membrane, called the *hilum*. This scar marks out the spot where the umbilical cord which conveyed nourishment to the seed was inserted. The membranes being removed the kernel appears, which consists of two parts, called Cotyledons, which are placed in contact with each other. These Cotyledons consist of small cells (*a*), containing in their cavities a nourishing substance, called *albumen*, from the Latin word *albus*, white. In the centre of these Cotyledons a little body will be seen, which is a very important part of the seed, hence called the *little heart* (Corcle); by Sir E. Smith named the *Embryo*. This is the principal portion in the whole seed. It contains the foundation of all that is afterwards to be produced. From the different cells, vessels, or tubes, (*cc*) conveying the nutritious fluids (when necessary) to the embryo, arise and take their course, as seen in the figure.



When the seed thus constituted, and at the same time possessing the principle of life, is exposed to the combined influence of Heat, Moisture, and Air, it undergoes several changes. The embryo enlarges and receiving nourishment from chemical changes taking place in the albumen, by which it is converted into *sugar*, shoots upwards and forms the part that rises above ground, called by botanists, (*a*), the *plumule*, and at the same time shoots downwards forming the part called the *radicle* (*b*) or little root. As these parts increase the cotyledons gradually become absorbed; the albuminous matter being converted into nourishment, the coverings at the same time begin to decay, having served the important purpose of protecting the seed while these processes (in the whole called Germination) were going on.

The seed in undergoing these changes swells very much; a fact proved by the experiments in which hollow balls of considerable strength have been filled with beans and peas, and have been split when the seeds began to expand: the power necessary to effect this being estimated as sufficient to raise a weight of nearly 200 pounds.

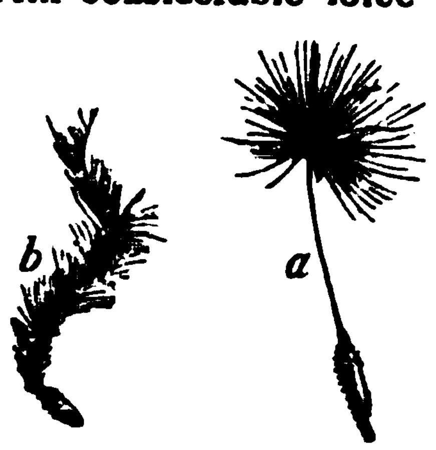
It may be a matter of surprise to some readers that the earth should not have been mentioned as connected with the process of germination, this being apparently as nearly allied with this series of changes in the seed as are heat, moisture, and air. However, this is not found to be the case: the earth not being essential to the germination of seeds. Sukkow made seeds to grow or germinate in Derbyshire spar: Humboldt, the celebrated traveller, in metallic oxides, sulphur, and powdered coal. Every one knows that seeds will grow in moss, if plentifully supplied with water; and most are acquainted with the interesting appearance of mustard seed growing on moistened flannel. The earth, it is true, is connected with germination by affording a means whereby heat, moisture, and air, may be applied to the

seed, and at the same time whereby the *light*, which is inimical to germination from the heat which accompanies its transmission from the sun, is excluded. As a further illustration that the earth is not essential to germination, the interesting fact that some plants grow upon others, hence called *parasitical*, or *parasites*, might be noticed. Such as missletoe, dodder: such also is the epidendrum flos aeris, a beautiful eastern parasite.

Having thus noticed the changes which take place in a seed, when undergoing the process of germination, a process ending, be it remembered, in the up-shooting of the plumule and the down-shooting of the radicle or little root, the next subject for consideration consists of the PRESERVATION of seeds.

In effecting the preservation of seeds, the Creator has devised some most interesting means. Some seeds are enclosed in hard impenetrable coverings, as the peach kernel, the plum, the cocoa nut, and nuts generally; some are defended by coverings called *capsules*, well beset with sharp spines, the thorn apple (Datura stramonium) for instance. Some seeds emit a fetid odour; and almost all are inclosed in some sort of covering; some in pods as the pea, the bean: some are carefully lodged in a fleshy mass, as the apple seeds. Any one need only to cut an apple across and see how carefully, regularly, and beautifully the seeds (pips as they are called) are disposed. Indeed, the mere mention of the circumstance of the preservation of seeds will be, it is hoped, quite sufficient to direct the minds of most to the observation of the means by which this is effected. In concluding, one law prevailing throughout nature in reference to the seed may be noticed, which is, the *more severe the climate the thicker is the skin of the seed.*

But it is necessary not only that seeds should be preserved, but also *propagated*. The means devised by the Creator for the PROPAGATION of seeds are peculiarly interesting. The covering containing the seeds or capsules, when the seeds become ripe, open at the top, and then as the strength of the plant is gradually diminished, the capsules become dependent and the seeds fall out. This is the case with the poppy, as every one can observe. The coverings of some seeds called *pericarps* are elastic; and being so, when the seeds are ripe, at which time the elasticity of the pericarps has attained its highest point, burst open and scatter the seeds with considerable force to the winds. This is the case with the wild cucumber and the broom, and many other plants. Some seeds have feathery heads of a downy nature, (*a*) called *Pappi*, such as the dandelion: some have what are called *tufts* (*b*), as the clematis, growing on chalky soils. Every one has seen the dandelion and the thistles seeds blowing over the commons and the fields, and how often, when a boy, has occupied his time in active pursuit after these winged travellers. One fact respecting this down may be noticed here. This is specifically heavier than the atmosphere: and consequently being so would not (in the same manner that a stone being specifically heavier than water will not float therein), be able to be wafted away, were not some contrivance made use of to compensate for this excess in weight. This compensation is effected by a peculiarity in the arrangement of the feathery-like points of the down; these uniting together form a kind of umbrella inverted, by which the seed is borne on the bosom of the air, lighter in weight than itself. Birds very often become the carriers of seeds: swallowing them and then evacuating them, without in many cases injuring their vitality. Indeed, it seems in some instances, that the passage of the seed through the body of the bird, is connected with some important influences.* The burrs very often attach themselves to the hides of oxen and to the fleece of sheep, and thus, when the animal is reposing in the pastures, are buried in the earth. The winds, the rivers, the ocean, are all the ministering conveyancers of these first rudiments of vegetable existence. Thus does God fulfil his plans.



As a circumstance connected with the preservation and the propagation of seeds, reference may be made to the exuberant abundance of seeds produced by one plant. One grain of wheat was so cultivated as to produce in a single season 21,100 ears, or about 576,840 grains, nearly one bushel of clean grain. (Philosophical Transactions, A.D. 1768). One plant of the white poppy yields 32,000 seeds; one of tobacco, 360,000; and the spleen-wort is estimated as producing on one *frond*, as its stalk is named, 1,000,000 seeds.

* It is a fact well known to the planters of olives in the south of Europe, that olives cannot be raised from seeds obtained in the ordinary way. The usual method to obtain olives, is, to collect the young olives growing wild in the woods, and to transplant them. It occurred to an ingenious planter, that the olive trees growing in the woods must have sprung from seeds, and that these seeds must have undergone some chemical change which enabled them to grow, while seeds obtained in the common way would not grow. The thought struck him, that these seeds were swallowed by birds, and by them transported to the woods, and that in passing through the intestines of the bird the chemical change necessary to make the seeds germinate had been produced. He followed out the thought: and made some turkeys swallow some olive seeds: these, after passing through the birds, were planted and produced young olives. This fact the writer first heard from Mr. Houlton, when Lecturer on Botany at the Royal Western Hospital.

On the other hand, to prevent a too rapid and a too profuse production of plants, the following wise preventive has been found to exist. It has been noticed already, that the result of the germination of the seed is the production of a plumule and of a radicle: the radicle being the part that is appointed to draw nourishment from the earth. The plant, it was stated also, is nourished at first by the albumen in the cotyledons. Every one must have observed that soon after the plumule has appeared above ground, the same assumes a sickly appearance. This sickliness of appearance indicates that condition of the young plant, in which it has ceased to receive nourishment from the cotyledons, and in which the radicle has not as yet taken on its duties. At this interval the plant has no supply; and the weaker, and consequently useless plants die, while those that are strong and healthy survive until the radicle, performing its duties, supplies the young plant with the proper share of nourishment, and enables it to go on to its perfection.

PRACTICAL CONCLUSIONS.

As heat, moisture, and air, are necessary to germination, it follows that the only proper methods for preserving seeds, consist of means by which these are excluded. Hence packing seeds in dry sand, and keeping them in dry places, are matters particularly to be attended to.

Hence again, when the Agriculturist wishes his seeds to germinate, he should not bury them very deep: because then they are not supplied with that necessary portion of heat, moisture, and air, essential to their growth. Hence it has often been observed, that after turning up to the depth of a few feet old ground, many plants have sprung up, which have not been seen for years; but now being brought near the surface, they come under the influence of the circumstances necessary to germination, and they shoot forth. The necessity of air is further established by the fact, that seeds will not germinate in earth under the exhausted receiver of an air-pump.

New seeds, from containing more moisture, and perhaps from possessing the vital principle in a state of greater activity, germinate more quickly and better than old. Fresh seeds, however, seem to produce more leaf and stem than old: hence cucumber and melon cultivators prefer old seeds. This is the explanation of the curious direction to be found in horticultural works: "If new seed only can be had, it should be carried a week or two in the breeches pocket, to dry away some of the more watery parts." The opposite extreme of keeping seeds until they become too old should not be run into. We may run from the water into the fire: or, to be more classical, we may in avoiding Scylla be wrecked on Charybdis; or, to be more scriptural, we may, in avoiding superstition fall into infidelity.

In some cases it is an object with the Agriculturist to hasten germination. This may be effected by immersing the seeds in a solution of oxymuriatic acid* for six or seven hours. Electrified seeds, moreover, pass rapidly through the first periods of vegetation.

To conclude: *Specific organization and life in reference to the seed are essential to the development of every species.* Genuine seeds only, let the Agriculturist remember, possess this specific organization and life, and consequently, if wishing to render his land productive to the full amount, he will select for use all those seeds which have the characteristics of genuineness.

SECTION II.—On the ROOT.

It was noticed that the seed in germination shot upwards the *plumule*, and downwards the *radicle*. This latter is the basis of the ROOT, now to be considered.

The principal part of the root sends off small branches, which are most properly called the *radicles* or *true* roots; and in the angles, formed by the offgoing of these, little spongy bodies are found which absorb the moisture from the earth, called *spongiolæ*, a term derived from the word sponge, from a supposed similarity in function. These die every year: and hence are said to be *annual* (annus meaning a year). Hence winter and early in spring, before the new radicles shoot forth, are the times for transplanting trees: and when trees are transplanted at other times, he will have the most success, who takes the greatest care not to injure any of these tender and essential parts.

The root itself receives different names according to the difference of its shape, and in relation to other circumstances. Those roots which generally and in common language are distinguished by the name may be first considered.

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* This may be purchased at the chemists, under the name of a solution of chlorine.

Several parts are necessary to form a perfect root (*a*): the outer skin or epidermis: next to this lies the cellular tissue: next to this (*b*) the bark or cortex is situated: on the inside of this is the inner bark, called also liber (*c*): next to this is (*d*) the wood; the outer softer of which having somewhat a different appearance, is called the Alburnum: and most internal of all is the pith (*f*). In addition to these parts *vessels* exist: the office and the appearance of which will hereafter be noticed.

As these several parts have individual duties or functions to perform, and as the knowledge thereof is essential to the proper application of some practical principles, they may be with benefit individually considered.

The outer *Skin* or *Epidermis*, is similar to that which forms the external covering of the bodies of animals, and as the corresponding part in animals is full of small holes to allow the passage of the perspiration and other fluids, and for the introduction of other substances, so, in plants, the same pores exist and serve the same purpose. Some plants have a beautifully smooth epidermis; some have the same very rough and sandy, as the common mare's tail. Indeed, a particular species of this plant, the Equisetum hyemale, is used by the Dutch for polishing, so rough is it. By the aid of chemistry, flint or siliceous earth has been found to exist in the stalks of many plants, and no doubt has been placed there for some important purpose. It seems in many cases to be a means of communicating strength; also a method of defending the plant from the injurious influence of excessive moisture, the siliceous matter being the principal constituent in that fine polish which exists on straw.

The *cellular tissue* (tissu cellulaire of the French) seen most conspicuously in leaves, is the part lying on the inside of the epidermis. This substance seems to be the source of colour to the plant, and thus stands in the same relation to the colour of vegetables, as the Rete Mucosum, or the part lying beneath the outer skin of animals, does to the colour of animals; this being white in the European, black in the Negro. Its use is not well known.

The third part is the *Bark* or *Cortex* (*b*). This part is of the greatest importance. It is formed in regular layers, and in general one layer is formed every year, so that the age of a tree may, in many cases, be ascertained by the number of its circular layers. In the carrot it is very thick, and constitutes the red part. Sometimes the layers may be separated like the leaves of a book one from another. This is the case with many trees belonging to the Mezereon family. One grows in Jamaica, the bark of which may be separated into very fine, as it were, lace: hence the tree is named "the lace tree." The mats which gardeners use to wrap up plants from the weather, is made from the bark of the lime tree (Tilia Europœa). This bark is known by the name of *bast*, and the mats are sent over to this country containing hemp and flax from the Baltic. The Japanese form their paper, and the Sandwich islanders their cloth, from the inner bark, liber (*c*), of the *paper mulberry*, called *wauti* by the natives, by botanists, *Morus Broussenneta* or *papyrifera*: and what is peculiarly interesting is, that by beating this prepared bark with differently shaped sticks or mallets, they make the cloth smooth like paper, like dimity, like corded muslin, or like the web of fine diaper. Stewart says that he has seen females with mantles as thin and transparent as Italian crape. Mr. Martin, of Rodmill, had the kindness to present to the writer of this article, specimens of cloth manufactured from bark brought home by Captain Cooke from Otaheite. The Egyptian reed, called the papyrus, is well known as being the principal source of the paper of the east.

The liber, or the inner bark, is well seen in cinnamon, which is the prepared inner bark of the cinnamon laurel (*Laurus Cinnamomum*). The cassia bark is the inner bark also.

The *wood* (*d*) is the solid, and, in reference to use, the most important of the whole. This consists of layers, embracing each other in the form of circles, or of the form of the tree, whatever this be; those layers nearest the centre being the hardest. Hence, the phrase so peculiarly pleasing to the British ear, "the heart of oak;" a part of the tree so hard that no insect, it is said, has been able to penetrate it. In trees having pith in the centre, the part lying nearest thereto is often softer, and of a different colour from the rest of the wood. The sapwood is called *alburnum*. Different woods vary much in their hardness and their tenacity; and a knowledge of the relative powers of the wood in this respect is highly important. Innumerable vessels pass through the wood, to which indeed the wood owes its tenacity, and which are connected together very intimately by what is called cellular substance. The difference in texture in the oak and the beech, the poplar and the elder, is very well known. It is very easy to trace the regular layers in the wood of the beech.

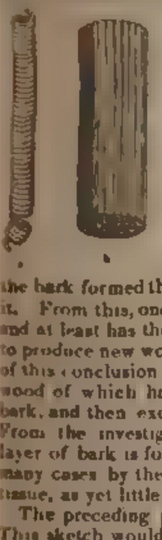
The colour of different woods is very various. The ebony is frequently jet black, some are almost white: the oak is brown.

Most internal of all the parts the *pith* (*f*) is met with. From its situation, and being thereby so carefully protected, physiologists for a long time supposed that it was a very im-

* Stewart's Journal of a Residence in the Sandwich Islands, 2 edit. p. 149.

portant part of the plant; and to be to plants what the spinal cord, vulgarly called the pith, is to animals. But this notion is not altogether correct; for Mr. Knight has shown that the pith has been removed, and the plant has not sustained any apparent injury. The pith varies much in its appearance. It is generally, though not always, in the centre: the reason of its deviation from the central situation being that the layers of wood are often much broader on the one side than on the other. As yet, the relation in which the pith is placed to the plant is not well known, although affording many useful substances. Thus the nutritious article called sago is obtained from the pith of a plant, growing in the East Indies, called Cycas circinalis. Balls made of pith are used abundantly for electrical purposes. The nature of the wick of the rush-candle is well known.

The *vessels* of the plant come next to be considered, inasmuch as it is through them that the sap, or nutritious juice, of the plant is conveyed, so as to afford nourishment to its different parts. Two principal sets may be noticed: the *central*, so called because lying nearest the pith; and the *cortical*, or those existing in the bark. The central vessels, as has been proved by the experiments of Dr. Darwin and Mr. Knight, carry the juices secreted from the earth by the spongiolæ on the radicles (forming in the aggregate the sap), up the tree, to be distributed through the branches, the flowers, and the leaves. The cortical, on the other hand, carry the sap after it has undergone the necessary changes into the roots: thus a complete circulation having been established, of the changes produced during this circulation notice will be hereafter taken. The central vessels, it may be noticed, are *spiral*, like a coil of wire, (*a*), and may be seen in the spring by bending a vine-twig so as to break the bark, when these vessels will be seen. The cortical vessels are generally *longitudinal* (*b*).



a b

Having thus described the individual parts of all roots, and of stems (stems and roots being in these respects similar), the next subjects of inquiry are, *How and when are those parts formed?* The reply is connected with some practical bearings, and consequently may be advantageously given. It is in reference to the formation of the wood that the most information has been obtained. This part seems to originate from the bark. The experiments of Dr. Hope and of Duhamel seem to establish this. Duhamel made a cut into the bark of a tree, so as to be able to introduce between it and the wood some pieces of tinfoil: after some years, the wood was found on the *outside* some of the tinfoil, showing that the bark formed the wood: or if not, proving this demonstration, that the wood did not form it. From this, one important practical conclusion originates. As the bark forms the wood, and at least has the power of reproducing wood and itself, it follows that it may be possible to produce new wood in old trees. Mr Forsyth, of Kensington-gardens, showed the accuracy of this conclusion by succeeding in the restoration of many large forest and fruit trees, the wood of which had been completely decayed, by gradually paring away the old wood and bark, and then excluding the air with an excellent composition prepared for the purpose. From the investigation of Mr. Knight, it appears, that a new layer of alburnum and a new layer of bark is formed every year. The epidermis, or outer skin, seems to be thrown off in many cases by the formation of a new epidermis. Regarding the formation of the cellular tissue, as yet little certain is known.

The preceding part of this Section has reference to roots, most commonly so designated. This sketch would however be imperfect, were no notice to be taken of other kinds of roots. Such roots as the potatoe and Jerusalem artichoke are called *tuberous* roots, or *tubers*, the usefulness of some of which is well known. Another kind of root is the *bulb*: such is the root of the common crocus. The lily, the garlic, and onions, belong to this kind of roots. The difference between the tuberous and bulbous roots is, that both being fleshy, the former have fibres at the side and at the top, the latter at the bottom.

Tuberous roots propagate very readily. It very often happens that one tuber forms another every year, and always at its side, and then dies: this forms another in the same way: this, a fourth; and so on, till the plant, at last, seems to have been transplanted: but this is Nature's transplantation.

One very important fact has been established by botanists, which may be beneficially known to the agriculturist. It is this, that some bulbous roots change their character completely when removed from the situation in which they exist naturally. Bulbs generally inhabit dry sandy soils, which, the least reflection will convince, are well suited to their structure. Hence some plants, the phleum pratense for instance, which when growing in wet marshy grounds has a fibrous root, become bulbous when removed to a dry situation: thus exhibiting not only an important practical fact, but also how the Creator has given a constitution to a plant by which it is enabled to suit itself to the circumstances in which it may be accidentally placed.

Many other names are applied to roots, as *horizontal*, *repent*, &c.; but these and others being taken from their form and direction, are so apparent that nothing further need be said.

It has been remarked that seeds will germinate *without* earth. It is not to be concluded from this statement, that to plants the *nature* of the soil is a matter of indifference: since no doubt can exist that roots prefer one soil to another. Mr. Knight performed some experiments on this subject. "He planted some parsnips and carrots in a poor gravelly soil, above a rich loam, the radicles of all penetrated to the latter, and fixed themselves eighteen inches

below the surface" of the ground. Willdenow planted a strawberry-plant in a sterile part of a garden, and the plant sent forth innumerable stalks and roots to the more fertile surrounding ground. And it is well known that pines, growing on bare rocks, will send out their roots in every direction to reach the soil below. Willdenow calls this the *selective* property of roots. At the same time that these facts are mentioned on this side of the question, it may be proper to notice others illustrative of the independence of plants in reference to the earth. Van Helmont placed a willow in a vessel full of dried earth, and took care that no vegetable or animal substance was introduced: it was regularly supplied with pure water: and at the end of a few years had grown its weight, having increased during that period from 50 to 169 pounds, the earth not having lost more than two ounces during that period. Boyle made a similar experiment.

SECTION III.—On the Stem. Trees—Shrubs—Pines—Palms. Ligneous Stems. Oak—the size of Stems. Lord Sheffield's Oak—The Banian—The age of trees—The old Hawthorn—Thorns—Prickles—Footstalk—Flowerstalk—Tendril.

The plumule, the part shot upwards from the seed, becomes at length the STEM, that part, with which the branches leaves and other parts of the plant, which may with propriety be called its plumage, are connected.

The stem has the same parts as the root, namely, the epidermis or scarf-skin, the cellular tissue, the cortex, the liber, the wood, the alburnum, and the pith: these parts sometimes being more distinctly marked. All stems, however, have not these parts: such only as are *woody*, hence called ligneous stems (lignum wood).

Ligneous stems are classed under four divisions:—Trees: Shrubs; the Pine Tribe; and Palms. The first three are perfect ligneous stems: the last is less perfect.

Trees and shrubs are distinguishable from each other by the disposition of their branches. They are, however, very nearly allied, since a shrub may be changed into a tree by a favourable change of climate and soil, and a tree into a shrub by an opposite change.

The pine tribe have many branches, sending buds out *at their extremities:* the central bud goes out in a straight direction: while the others surround this something in the form of a funnel, which disposition of parts is named a *whorl*. The common fir exhibits this in its growth very clearly.

The first three varieties of ligneous stems send out BRANCHES. Every tree has its own form of branching. A knowledge of the forms assumed, which is essential to the land-owner when wishing to ornament his grounds, can be obtained only by a constant learning in the forests, one of the seminaries which the Creator has established for the instruction of man. In fact, in no way but by a knowledge of these forms can the *effect*, as it is called, of plantations be fully obtained. The observant planter can often detect the errors of the landscape painter in this respect. Strutt gives, in his Sylva Britannica, and his Deliciæ Sylvarum, much information in this respect.

The oak, in its branchings, forms a most splendid object. The poet thus speaks of an oak at the village of Cowthorp, near Wetherby, in Yorkshire:—

> " When the huge trunk, whose bare and forked arms
> Pierced the mid sky, now prone, shall bud no more,
> Still let the massy ruins, like the bones
> Of some majestic hero, be preserved
> Unviolated and revered:
> Whilst the grey father of the vale, at eve
> Returning from his sweltering summer's task
> To tend the new-mown grass or raise the sheaves
> Along the western slope of yon grey hill,
> Shall stop to tell his listening sons how far
> She stretched around her thick-leav'd ponderous boughs,
> And measure out the space they shadowed."

Indeed many of our most generous feelings are associated with the oak. It is one of the most majestic of trees: and is rendered an object of awe when linked by remembrance with the bloody rites of druidism.

The SIZE of some stems is truly astonishing. Pliny mentions a tree, in the hollow trunk of which Lucian, the Roman consul, supped and slept with twenty people. The oak at Cowthorpe, already noticed, measures sixteen yards within three feet of the ground, and close by the ground twenty-six yards. In Lord Sheffield's park is a large oak: his late lordship was very proud of it. It is well worthy of a visit. In fact, the Sussex oaks are famed for many excellent qualities. They grow in a soil which, from their abundance and superior growth in the same, is called *oak-tree clay.* A chesnut-tree grows on Mount Etna of an extraordinary size; so large, indeed, as to cover a hundred horsemen: hence called *centum cavalli* (hundred horse). The banian tree is the largest of all trees. It forms by the extent of its branches groves for the inhabitants of the sultry East to walk in: and besides having a principal stem,

its branches send off shoots which penetrate the earth, and thus afford support, becoming, as it were, additional roots. Heber mentions one which occupies the whole of an island of the Nerbudda: and, in its best days, afforded shelter for ten thousand horse. A great part has been destroyed by the sea, but a sufficiency remains to make it one of the noblest groves in the world.

It may be inferred, that as trees attain a great size, they attain also a great AGE. This age is ascertained by the number of concentric layers, of which, as noticed before, one is formed yearly. In the New Forest, Evelyn, that lover of nature, counted in the sections of some trees three hundred and four hundred concentric layers of wood. Gilpin, besides, in his Forest Scenery, mentions "a few venerable oaks in the New Forest, that chronicle upon their furrowed trunks ages before the conquest." Not a hundred years ago, the oak in the New Forest against which the arrow of Sir William Tyrrel glanced before killing William Rufus, is said to have been standing, though in such a state of decay, that Lord Delaware erected a monument to indicate the spot

> "dry and dead,
> Still clad with reliques of its trophies old,
> Lifting to heaven its aged hoary head,
> Whose foot on earth hath got but feeble hold,"

stands many an oak tree, in many parts of our lovely world, as a remembrance of former times, as a means of awakening the finest feelings that thrill the human bosom, and of drawing a tear from the eye of the child of nature.

The stems of various trees vary much in the different periods of their growth: so that the trees planted in our boyhood and youth, are hardly known when seen in the days of maturity. The following passage, so full of feeling as to be worthy of Evelyn, refers to the opposite character of one tree.—"The trunk of an old hawthorn is more gnarled and rough than, perhaps, any other tree; and this, with its hoary appearance and its fragrance, renders it a favourite tree with pastoral and rustic poets, and with those to whom they address their songs. Milton, in his L'Allegro, has not forgotten this favourite of the village:—

> "Every shepherd tells his tale
> Under the hawthorn in the dale."

When Burns, with great force and delicacy, delineates the pure unsophisticated affection of young, intelligent, and innocent country-people as the most enchanting of human feelings, he gives additional sweetness to the picture by placing his lovers

> "Beneath the milk-white thorn that scents the ev'ning gale."

There is something about the tree which one bred in the country cannot soon forget, and which a visitor learns sooner than any association of placid delight connected with rural scenery. When, too, the traveller or the man of the world, after a life spent in other pursuits, returns to the village of his nativity, the old hawthorn is the only playfellow of his boyhood that has not changed. His seniors are in the grave; his contemporaries are scattered; the hearths at which he found a welcome are in the possession of those who know him not; the roads are altered; the houses rebuilt; and the common trees have grown out of his knowledge. but, be it half a century or more, if man spare the old hawthorn, it is just the same—not a limb, hardly a twig, has altered from the picture that memory traces of his early years."—*Library of Entertaining Knowledge*, p. 156, 157.

But to return to description.

Many branches are supplied with THORNS and PRICKLES. Thorns are branches, though stunted in their growth, as gardeners frequently prove by cultivating fruit trees, which though when wild are thorny, when cultivated, become perfectly smooth. Prickles differ in being only a part, or a projection, of the bark; hence these are not convertible into shoots. The uses of thorns and prickles are, no doubt, connected with the protection and the preservation of the plant, for plants in their wild state are most liberally supplied with these parts, whereas, when cultivated, that is, when placed under the care of man and consequently protected, they loose these protections.

Besides branches, thorns, and prickles, there are other parts connected with the stem, and these are the FLOWER-STALK, the FOOT-STALK, and the TENDRIL. The flower-stalk is that

which supports the flower; the foot-stalk that supporting the leaf and these are composed of cellular tissue, and central and cortical vessels for conveying the vegetable juices. Tendrils may be considered as foot-stalks lengthened. Theirs is the spiral form, this form being that which peculiarly belongs to climbing plants, which, being unable to support their own weight, attach themselves by means of their tendrils to surrounding bodies. The spiral form, moreover, enables the tendrils to ascend and to grow upwards, as is proved by the circumstance observed by naturalists, that tendrils, when young, are usually put forth in a *straight* direction, but presently become *spiral*, as represented in the accompanied sketch.

The remaining division of the Stems is that of the PALMS. These trees have a very peculiar growth. The stem of the white lily (Lilium Candidum) cut across will give some idea of the growth of stems of this nature. The stem is formed of the foot-stalks of the leaves. The leaves are produced in circular crowns, which would render the stem very thick, were it not that its side growth being prevented by the preceding circular band, the tree must shoot upwards, and hence the great height to which palm-trees attain.

SECTION IV.—On the BUD. { Leaf-bud—Flower-bud—Budding. Grafting the protection of the Bud in cold countries.

The bud is an object of great interest, for, independent of its intrinsic beauty, its appearance is associated in our minds with the approach of that very delightful season, the spring. Nature then begins to put off her garments of widowhood, and to assume the dress which is the peculiar delight of the eye, green. The bud, moreover, emblems young beauty just exhibiting her charms, afterwards to be developed in the full glories of mature age.

A bud is the miniature of all the parts that are afterwards formed from it. It consists of the germs, the first rudiments of these parts; which lie in the bud in a dormant state till the appointed season, when the development begins, and proceeds in all its glory.

Buds are of two kinds; *leaf-buds* and *flower-buds*. The former are small, long, and pointed: the latter are short, thick, and round. Leaf-buds are convertible into flower-buds; a fact of the greatest importance, which was accidentally proved by the following circumstance:—The Solandra grandiflora, a native of Jamaica, had long been cultivated at Kew, in the stoves, being well supplied with water, without shewing any signs of flower or of fruit. One plant was left by accident in a dry stove, and the consequence was that the branches were much stinted in their growth, and that flowers were produced. The experiment has been frequently tried, and with success. The supply of the nutritious juices was in this case diminished, and consequently the plant no longer at its first development exhausted all its energy, but, gradually having attained power, produces flowers and fruit. It is on this account, that the *transplanting* of fruit trees is frequently had recourse to in order to make them produce fruit. The roots in the process of transplanting have been injured, the supply of sap is consequently diminished, the plant does not increase in size, but propagates its kind by the production of flower-buds. The process of *dwarfing* is another illustration of the fact that leaf-buds can be converted into flower-buds: since when a rank growing fruit tree is engrafted on a slow growing stock, the engrafted branch will, from the scantiness of the supply it receives from the slow growth of the stock, come earlier into fruit than if it had been supplied with abundant nourishment. Indeed, every thing that checks the luxuriance of supply in regard to the sap, tends to the formation of flower-buds, and consequently of fruit and of seeds: and this checking is generally effected by scoring the bark to the wood very deeply with a knife, by twisting wires round the stem and branches; by cutting off a cylinder of the bark and replacing it with a bandage; also by exposing a portion of the roots of the tree during winter, so as to diminish their vigour. "In some standard fruit trees, *honeysuckle* indeed (says Dr. Walker in his Economical History of the Hebrides, ii. p. 228), may be applied with great advantage; these, when even of considerable age, do sometimes continue to run so much to wood, and especially towards the heart of the tree, that it remains quite unfruitful. To plant a vigorous honeysuckle at the foot of such a tree is an easy effectual remedy, and much better than any pruning. The honeysuckle grows up, occupies the heart of the tree, checks its luxuriance, directs its vegetation towards the extremities, and renders it fruitful. A large apple tree of the above description, above fifty years old, and which had always been barren, was rendered by this practice extremely fruitful. When this end is answered, which will happen in a few years, the honeysuckle should then be removed before it becomes injurious."

Those concerned in plantations may derive much practical benefit from the proper application of this fact. Thus, when a very young tree exhibits flowers and produces fruit, a premature decay and death are indicated. Hence nourishment in these cases should be supplied. When the young fir-tree produces cones, it is from the soil not being favourable to its growth.

Leaf-buds and flower-buds both agree in one respect, namely, that they may be removed to another stock with success; differing however in this, that the leaf-bud only will shoot forth or vegetate when removed from its original situation and placed in the earth. The former operation is called *budding* or *inoculation;* and what is very curious, is, that the bud preserves all its peculiarities, while the stock remains unchanged; the crab, on which the finest apple has been inoculated, still remains a crab. In some cases, five or six different species of fruit being budded on the same tree, afford, when in fruit, a most pleasing spec tacle. The gardener is aware of the difference between *budding* and *grafting;* the latter being the introduction of a small *branch* into another stock of the *same genus* or kind. And it is equally well known, and Miller asserts the same, that those trees only can be grafted on each other with success, that belong to the *same tribe*; a circumstance in which the animal and vegetable kingdoms agree.

It is pleasing to notice the care which the Creator has taken of buds, in giving them coverings suited to the season of the year in which they are put forth, and to the climate in which they grow. In northern regions the buds are clothed with scales or with a downy substance, sometimes with both, and sometimes a coating of resin is added. Most have observed the bud of the horse-chesnut. This tree may in its budding be said even to anticipate the spring; and see how its bud is protected. It is covered with a dozen pair of scales, one lying over the other so as to make a kind of tile work, the outer scales being hardest, and the surfaces united together by a resinous varnish. By these means the bud is defended from the inclemencies of the season. The preserving influence of these circumstances is evidenced by the fact, that if a horse-chesnut bud be gathered before it has begun to be unfolded, and the point at which it was separated from the tree be coated with sealing wax and then immersed in water, it will remain there for years without undergoing any change. In warm countries, on the other hand, buds have few or no protecting scales. In tropical regions, the rapidity and the luxuriance of growth are such that the preparatory stage of the formation of buds, which generally takes place about the midsummer of the preceding year, seems scarcely to occur.

Such is a brief history of this interesting exhibition of vegetable life; and such an account fits us for the contemplation of the next exhibition, namely, the formation of the leaf.

Section V.—On Leaves—Structure—Properties of Leaves. Irritability—Sleep—Absorption—Perspiration. Differences of the Perspired Fluid, produces Chemical Changes on the Air. The Colours of Leaves—The Fall of Leaves.

The leaf is an object peculiarly pleasing. It is the clothing of the tree, and its beauties are known to every admirer of nature. The immense variety of shapes assumed by this part of the vegetable system is astonishingly great, and is such as will always confer upon the study of plants thus dressed, an interest which the constant succession of fresh forms invariably produces. Not only does the shape vary but the colour also; and presents in its shades tints varying not only in different individuals, but in different periods of the same individual.

The *structure* of leaves is very simple. It consists of an *outer skin or cuticle* (a), which is full of pores, the upper surface being varnished as it were: then *cellular substance* (b) seen when the cuticle is removed; and then *vessels* (c), which form the beautiful appearance seen in the accompanying wood cut. The vessels are a continuation of the central vessels already described.

The leaves are all contained in the bud folded up with the greatest care, as may be seen by opening any bud early in the season. The genial warmth of spring rouses the vital energy into activity, and the bud unfolds itself. Different plants and trees have different times at which they put forth their leaves.* A knowledge of these times is very useful to the plantation maker, who wishes to have all the parts of the plantation so arranged as to produce propriety of effect.

Having noticed the structure of the leaf, the subject next to be investigated is the *properties* of this part of the vegetable economy.

Some leaves possess the property, when acted upon by certain bodies, of moving. This is called, in reference to leaves, Irritability. This irritability is connected with the leaf, as is proved by the circumstance that when the leaf of a vine is suspended from a string it turns towards the light, just the same as when upon the vine itself. It is well known that all plants will turn towards the light; since if a hole be made in a shutter in a darkened room, plants will shoot towards the same. The Mimosa sensitiva will, when the leaves are touched, fold together. This curious plant seems in some circumstances to lose its irritability. Desfontaines carried one a considerable distance in his carriage; at first the leaves from the motion of the carriage closed, but afterwards ceased to move, though the motion continued. In some circumstances it seems to be affected by one kind of stimulus and not by another. Some ladies having visited the garden at Vosges, one was invited to put her hand upon the above-mentioned plant, so as to make the leaves fold together; she refused at first, but at length applying her hand, the leaves would not fold; whereas another lady standing by, applying her hand, the effect was immediately produced.

* Any communication sent to Mr. Baxter, of Lewes, directed J. E. containing exact details of the times at which leaves of different trees appear, will be esteemed.

The bodies that act as stimuli in calling forth the activity of this irritability are very numerous. There is a plant called the Porliera hygrometrica, growing in South America, having feathery leaves, which contract with unerring certainty upon the approach of wet weather. The Dionæa Muscipula, called also the *fly-trap*, closes its curiously-constructed jointed leaves, beset with spines at their rims, whenever an insect comes in contact, and only then.

Not far from the road-side between the King's Head and Newick, in Sussex, is a place called Jack's Common. At the lower end of the common, a kind of bog exists. In this bog, the Sun-dew (Drosera) grows. This is a most interesting plant: its leaf is circular, and from its margin little hair-like fibres arise, at the extremity of each of which is a little globe of transparent viscid liquid, the upper surface also of the leaf being beset with hairs, containing a viscous juice. The appearance produced by the sun shining upon these little spheres is truly splendid, and will reward any observer of Nature for visiting the spot. Whenever an insect gets upon the leaf, these little fibres close over, and by the viscid liquor embrace and prevent the escape of the insect. This property of the sundew has been denied by some, and doubted by others; but Mr. Joshua Mantell and Dr. Epps obtained a specimen of the plant, in which the insect was found so enveloped.

Many other instances illustrative of this property of the leaves might be given; but these are sufficient for our purpose.

Leaves possess the property of *sleeping*. The sleep of plants was first noticed by Garcias, who observed this appearance in the tamarind tree. Linnæus paid great attention to this peculiarity of plants. The Mimosa Sensitiva closes its leaves at night. Many plants with leaves arranged as in the acacia, called *pinnate*, do the same. The absence of light seems to be connected with this; since Decandolle found, that, on placing the mimosa pudica in a dark cave, which he afterwards lit up with lamps, the leaves expanded. This was at midnight, whereas, on the following day, when the lights were extinguished, they closed. Many flowers, it is well known, close when the sun sets.

Another property of leaves is that of taking up liquids, called ABSORPTION. A philosopher named Bonnet, is the person to whose experiments on this subject reference is principally made. He found that some plants lived equally well when either the upper or the under surface of the leaves was exposed to water: some lived longest when their upper surface was exposed; some, as the vine, the poplar, and the walnut died when their upper surfaces were laid on the water; some, as the white mulberry, thrive best with the under surfaces of their leaves exposed.

As leaves absorb, it is natural to expect that they will *give out* fluids. This property is called PERSPIRATION. Hales, a great naturalist and philosophic chemist, ascertained the fact that different quantities of fluid are perspired from different plants, and calculated the quantities. Succulent plants perspire sparingly: hence the Creator has planted them in the arid desert. Thin leaves yield most perspired matter: the Cornelian cherry (Cernus Mastica) throws out, according to Duhamel, a quantity of fluid twice its own weight in twenty-four hours. Water and bog plants perspire more copiously than any others. The plant called the sarracenia has leaves so constituted as effectually to exclude the rain from the hollow cavities which, by a peculiar confirmation of the leaves, are formed in them. These cavities, however, always contain a certain quantity of water or liquid, which the plant must either secrete or perspire. The leaves of the Nepenthes Distillatoria are so contrived as to form a kind of pitcher, containing about two ounces of water, in which a small shrimp generally lives.

The perspired fluid is in most cases similar to the sap. It differs, however, in some cases, and affords some very important drugs. The orange exudes sugar; the lime, glutinous matter; the poplar, a resinous substance; a species of ash (Fraxinus Ornus) gives out manna; the dictamnus albus gives out a highly-inflammable gas. The honey-dew was once considered to be an exudation from vegetables, but now it is supposed to be produced by an insect.* Wax has been gathered from the leaves of the rosemary.

The leaf has another peculiar power attached to it, namely, that of *producing chemical changes on the air*. It may here be proper to remind the reader, that the air we breathe consists of two invisible bodies, called *oxygen* and *nitrogen*. The former is that principle which supports life, as without this man could not, constituted as he at present is, live. However, it is too strong to be breathed alone. The other, by itself, is destructive to life, and its principal office seems to be to moderate the effect of oxygen. It appears, also, that when we breathe, the oxygen is separated by the blood in the lungs from the nitrogen, and, combines with another invisible body, called *carbon*, with which the blood is loaded when it arrives at

* In Gills's Technilogical Repository for April (p. 201) the following occurs:—" Mr. Carpenter happening once to beat down a number of aphides out of a stunted oak tree, at the foot of which was an ants' nest, was very much surprised at seeing, soon afterwards, the ants busily employed in carrying up the aphides, and carefully replacing them again upon the leaves of the tree: they feeding upon the honey-dew, which, it is well known, is produced by the aphis."

the lungs. The body formed by the union of the oxygen and of the carbon is called *carbonic acid*, and is injurious to life, both men and animals dying when exposed so as to breathe it: indeed, it is the same body as that which arises from the burning of lime, the injurious nature of which is known to most. Thus the breathing of man and of animals renders the atmosphere impure. Plants seem to have the same effect upon the atmosphere, taking its oxygen, and changing the same, by its combination with their carbon, into carbonic acid. In some cases, however, oxygen gas is given out: namely, when the plant is *directly* exposed to the rays of the sun, as may easily be proved by putting a sprig of mint in a glass jar filled with water, and turning the jar upside down into a plate containing water. It will be found, on exposing the whole to the sun's rays, that a gas will escape to the top of the jar, and will displace a portion of the water.

Mr. Ellis has, however, further established that the production of oxygen is entirely confined to the *leaves* and other *green* parts of plants: and that the flowers, the fruit, and the stems, as well as the roots of vegetables, both in the sunshine and in the shade, convert always the oxygen gas into carbonic acid. Hence may be understood the opinion that it is injurious to sleep in a room where there are many flowers, carbonic acid being given out.

The interest of the subject increases every step; and much might be written on the colours of leaves, and the causes of the difference in colour: but one fact, however, shall be referred to. It is taken from Silliman's Journal, vol. xiii. p. 193. It frequently happens in America, that clouds and rain obscure the atmosphere for several days together, and that during this time, buds of entire forests expand themselves into leaves. These leaves assume a pallid hue till the sun appears, when within the short period of six hours of a clear sky and bright sunshine, their colour is changed to a beautiful green. A writer in Silliman's Journal mentions a forest on which the sun had not shone for twenty days. The leaves, during this period, had expanded to their full size, but were almost white. One forenoon the sun began to shine in all its brightness. "The colour of the forest absolutely changed so fast that we could perceive its progress. By the middle of the afternoon the whole of these extensive forests, many miles in length, presented their usual summer dress."

It is well known that plants that grow in the dark are pale-coloured. Individuals living in closely inhabited cities are frequently pale, which paleness is often lost, when living in the country.

It will thus be seen in what respects leaves act the part of lungs to the plant: and the reader will henceforth feel his heart expand in gratitude to his Creator, when standing before some majestic tree, clothed in all the beauty of verdure, and having, in the form of green leaves, a vast assemblage of *lungs*, if we may so speak, by which it is continually effecting those great changes in the atmosphere which the Creator has appointed for its performance.

But the loveliest objects must fade. Beauty must cease, and death triumphs over all parts of animated nature. The leaf itself is born to fade: its *fall* is now to be considered.

Who has not felt the splendour of an autumnal landscape? Who has not seen, with a peculiar succession of hallowed feelings, the rich hues of a grove at the close of autumn? The vivid green has now faded into a duskier hue: the wind shakes, every breath that blows, some extreme leaf to the ground; and every suggestion of the mind emblems to itself the passing nature of all things here. The thoughts revert to the time when even our frames, now perhaps vigorous, shall be like the scene before us: or perhaps our bodies *are* withered like these teachers of truth. The sap of youth is changed into the richer juices of manhood: or may be these have produced the fruits of age, and the body, exhausted, is now about to pass away in autumnal glory to the land of rest. Such thoughts pass through the mind on such occasions: and by what are such thoughts produced? By this simple circumstance,—*The fall of the leaf!*

> We learn a lesson every where: the grove
> Is ours; and ours the instruction.—What?
> Thy glory, man, must fade.
> Yes, fade. Thy virtues? No: these are perennial:
> Plants that ne'er drop their leaves, or dropping
> Quickly formed, no barrenness to show.—
> Oh! plant them thickly: let no niggard hand
> Refuse the source whence beauties ceaseless spring.

Section VI.—On Fruit-bearing or Fructification.

All these parts which have been considered, have respect in their operation to two important results. The first is to act upon surrounding bodies, either by producing chemical changes, or by affording to them shelter, comforts, and pleasure. The second is *to propagate the kind;* for as in animals so in vegetables there is a regular succession of existencies. One generation follows another: the tree produces the tree; and the herb the herb. The parts particularly concerned in effecting this grand object are seven; the calyx, the corolla, the stamens, the pistils, the seed vessel, the seed, and the receptacle.

The Calyx is the cup, generally of a green colour, that embraces the flower; hence called by some the *flower-cup*. It has a great variety of forms, and under these different forms

serves the purpose of protecting the delicate flower or corolla, which is the part engaged in fructification, next to be considered. The leaves of which the calyx is formed are called sepals.

The Corolla is that beautiful part of the plant which every one must admire. It is the summer dress of nature, and with it we adorn our gardens, our houses, and our persons. We look forward with great pleasure to the unfolding of these beauteous objects, and who is there who has not experienced the delight connected with the observation of the quiet and scarcely perceptible opening of the flower-bud? The immense variety in colour, form, and size of this part of the vegetable being is truly astonishing, and is beneficially made use of by every horticulturist. With respect to size it may be noticed that a flower has lately been observed, called the Great Flower of Sumatra (Rafflesia Arnoldii). The breadth of this flower is more than three feet. The leaves of which the corolla is formed are called petals.

Looking into the centre of the flower, little thread-like bodies are seen, each one having a little box at its top. These thread-like productions are said to be the male parts of the flower, and are called the *stamens*, *stamina*, or *chives*; the *thread-like* part being named the *filament*; the *box*, the *anther*, which contains inside a dust, called *pollen*. The number and the situation of these filaments vary in different plants; a circumstance of which Linnæus, as we shall find presently, has made important use.

A part frequently connected with the flower is the Nectary or the Honey-cup; because it frequently contains honey.

Besides the little thread-like bodies just noticed, other bodies are found in the centre of these, as may be seen in the accompanying figure. This body is called the *pistil* or *pointal*, and is considered as the *female* part of the flower, consisting of three parts; (*a*), the *stigma* at the top; (*b*), the *style* in the middle; and (*c*), the germ at the bottom. All these parts have their uses; at present it may be proper to remark that the germ contains the seeds, and at length becomes enlarged so as to form the *pericarp* or *seed vessel*, which is the next part of fructification.

The seed vessel serves to protect the seed till ripe: it then opens and lets the seeds escape to be distributed at the appointed places. Sir E. Smith refers to a very interesting fact, namely, that in the sandy deserts in Africa, the seed vessel opens only in rainy weather; by which means the seeds are enabled to obtain sufficient moisture to enable them to grow.

The seed has been already considered.

The receptacle is the part which supports all the parts that have been described.

This brief description of the individual parts concerned in fructification, and of their individual uses, being given, a few remarks may be made upon the peculiar circumstances in connexion with the stamens and the pistils, the male and the female parts of the flower.

The fullness of importance connected with these parts of the flower was not clearly known till the time of Linnæus. From the earliest times the fact has been properly appreciated that the Date Palm, in order that abundant and well flavoured fruit might be produced, should be so planted that the trees which have stamens should be close to those having pistils (these trees, be it remembered, having on separate trees flowers possessing only one of these parts). It is also well known, that mulberries produce more fruit when planted near one another.

Several hints were thrown out by botanists at different times, that the use of the stamens is to perfect the seed. Linnæus, however, in his works, *Fundamenta* and *Philosophia Botanica*, completely established the essential nature of the stamens and pistils, by showing, by a variety of experiments, that the seeds could never be perfected unless these were brought so as to act upon each other. The instrument of communication and the agent concerned is the *pollen*, which is contained in the anther noticed before. This pollen seems to be the principle which communicates to seed that peculiar condition that either produces or awakens its dormant vitality. The stamen, as communicating this fecundating principle, is called in the system of Linnæus the *male* part; the pistil, being the recipient, is called the *female*. To complete the action of the fecundating principle, several most interesting plans have been devised by the Creator.

Every one must have observed that many, very many, of our trees produce flowers in the spring either before the leaves appear, or before they have attained any size. It is equally apparent that at the same season the winds blow considerably. Hence the phrase "March winds, April showers." By means of the winds the pollen of the stamens is brought into contact with the pistils; and the absence of leaves is also an absence of an impediment, which, were they present, would have prevented the ready passage of the pollen.

Some, indeed many trees, flower after the leaves have appeared, and when no winds blow. Then insects have appeared. They become in their journeyings of pleasure from flower to flower, the porters who bear the impregnating principle. Every one has observed how the legs of the bee are covered with a golden dust, which is the pollen of the flowers. In seeking the honey, the pollen is frequently rubbed off from the diligent and busy animal's legs, and is deposited in its proper recipient.

With the same object in view, namely, the ensuring the dispersion of the pollen, it happens that in some flowers where the stamens lie away from the pistils, whenever the pollen is ripe, the stamen alters its direction, and comes in contact with the pistil. Thus in the

Kalmia the stamens are received into little pouches in the corolla, being bent in curves away from the pistil; when the pollen is ripe, they are disengaged from the pouches, and strike with considerable power from their elasticity upon the stigma, which is, it will be remembered, the upper part of the pistil. In the Aristolochia Clematitis, the dispersion of the pollen over the pistil is effected by a very peculiar contrivance. This flower is globular at the lower part, and it is in this lower part that the stamens and pistils are: the anthers moreover are below the stigma, and the upper part of the flower is tubular or in the shape of a funnel. The object is to bring the pollen into contact with the stigma, which, be it remarked, is situated above the anthers. An insect effects this: the tubular part of the flower is beset with inflexed hairs, so that the fly enters easily, but, when once in, cannot get out till the corolla fades. In attempting to get out, however, the insect effectually distributes the pollen.

Many other illustrations might be given. The flowers of the barberry bush may be noticed in conclusion. The flower of this shrub has six stamens, which spread and are sheltered under the concave lips of the petals. Directly any unusual body, as the feet of an insect, touches the inner part of the filament near the bottom, the filament contracts, and consequently strikes its anther against the stigma.

Some stigmas, it may be added, are glutinous, by which means the pollen is more easily caught and more pertinaciously held. In the Jacobæan lily (Amaryllis formosissima), Linnæus noticed a drop of transparent liquid protruding every morning from the stigma; which, having received the pollen that falls during the day, is re-absorbed during the afternoon, and the pollen is thus conveyed to the seeds contained in the germen.

This last remark, leads to a question whether the pollen is actually conveyed down the style, which often is an open tube, into the germen to the seeds, or is its influence only conveyed? This question is not yet decided: great difference of opinion prevailing. Some pistils have no styles it may be proper to notice.

Such seems to be the uses of the stamens and pistils; uses so conspicuous and so important, as to be well worthy of the notice here taken.

CHAPTER III.—*On the General System of Linnæus.—The Classes and Orders of the Linnean System.*

Linnæus, having ascertained that the stamens performed one function and the pistils another, was led to conceive that on these facts he might found an arrangement of plants, which then had become so numerous as to be very burdensome to the memory. A system is a most stupendous work: and a Linnæus was required for its completion. Let the reader conceive upwards of fifty thousand different plants placed before him, and let him fancy that he is required to arrange these so as to bring together into different lots those which resemble in some general marks; and then, having arranged these general lots, to have to place these into smaller lots, linked by other points of resemblance; and then to describe each individual under these lots, so that the same may be known from every other individual: and then to enumerate the different sorts of that individual; and, finally, to notice the slight variations that may occur in these sorts. Such a task, all must allow, is an arduous one; but such a task did Linnæus perform.

A system, therefore, is nothing different from an arrangement. It is the putting together of facts, of things, or of principles, so as to form a suitable whole. It is the raising of a building, after the stones have been digged out of the quarry. But to make a good system, the parts must be proportioned well: no parts must be out of place. The parts in Linnæus's system are Classes, Orders, Genera or kinds, Species or sorts, and Varieties. The Classes are founded upon the STAMENS: that is, it is from the stamens that the characters for distinction are drawn. The Orders are founded, in some of the classes, upon the pistils. The Genera, as to the distinctions between them, are founded upon the seven parts of fructification. The Species have distinctions still more minute: and the varieties still more so. To illustrate, however.

Of the Classes.

The Classes are 24 in number. The first eleven are founded upon the simple number of the stamens.

1.	*Monandria.*	One Stamen.
2.	*Diandria.*	Two Stamens.
3.	*Triandria.*	Three Stamens.
4.	*Tetrandria.*	Four Stamens, of equal length.
5.	*Pentandria.*	Five Stamens.
6.	*Hexandria.*	Six Stamens, all of equal length.
7.	*Heptandria.*	Seven Stamens.
8.	*Octandria.*	Eight Stamens.
9.	*Enneandria.*	Nine Stamens.
10.	*Decandria.*	Ten Stamens, filaments separate.
11.	*Dodecandria.*	Twelve Stamens, to nineteen, inserted on the receptacle.

The twelfth and the thirteenth classes are distinguished by the number and also by the part on which the stamens are inserted.

12.	*Icosandria.*	Twenty or more Stamens, inserted upon the *calyx* or *corolla.*
13.	*Polyandria.*	Many Stamens, inserted into the *receptacle.*

The fourteenth and the fifteenth classes are founded upon the *proportion* that the stamens bear to one another.

14.	*Didynamia.*	Four Stamens, two long two short.
15.	*Tetradynamia.*	Six Stamens, four long, two short.

The sixteenth, the seventeenth, and the eighteenth classes are founded upon the *union* of the stamens.

16.	*Monadelphia.*	Filaments united at bottom, but separate at top.
17.	*Diadelphia.*	Filaments united in *two sets.*
18.	*Polyadelphia.*	Filaments united in *three* or *more* sets.

The nineteenth class refers to the *union* of the anthers.

19.	*Syngenesia.*	Anthers united. Five Stamens: flowers mostly compound.

The twentieth class is known by the insertion of the stamens.

20.	*Gynandria.*	Stamens inserted on the pistil, or on a pillar elevating the pistil.
21.	*Monœcia.*	Stamens and pistils in separate corollas, upon the same plant.
22.	*Diœcia.*	Stamens and pistils in distinct corollas, upon different plants.
23.	*Polygamia.*	Various Situations. Stamens only, or pistils only, along with bissexual flowers.
24.	*Cryptogamia.*	Reproductive organs scarcely visible, so that they have not been distinctly described.

Such are the classes; and under some one or other of these every plant known has been arranged. The formation of these classes evidence the mighty mind of the contriver, and make known the peculiar characteristic of a great mind, namely, the arrangement of particulars into generals.

Of the Orders.

SECTION I.—The order of the following thirteen Classes:—1. Monándria—2. Diándria—3. Triándria—4. Tetrándria—5. Pentándria—

6. Hexándria — 7. Heptándria — 8 Octándria—9. Enneándria—10. Decandria—11. Dodecandria — 12. Icosándria — 13. Polyandria, are taken from the number of Females or Pistils, and terminate in *Gynia*, as the Classes did in *Andria*, with the Greek numerals preceding: thus—

Orders.	Explanation.	Orders.	Explanation.
1. Monogynia	1. *Pistillum.*	7. Heptagynia	7. *Pistilla.*
2. Digynia	2. *Pistilla.*	8. Octogynia	8. *Pistilla.*
3. Trigynia	3. *Pistilla.*	9. Enneagynia	9. *Pistilla.*
4. Tetragynia	4. *Pistilla.*	10. Decagynia	10. *Pistilla.*
5 Pentagynia	5. *Pistilla.*	11. Dodecagynia	12. *Pistilla.*
6. Hexagynia	6. *Pistilla.*	12. Polygynia	*many Pistilla.*

SECTION II.—Class 14. *Didyna mia*, has the Order taken from the situation of the seeds.

1. Gymnóspérmia.........................*Naked Seeds.*
2. Angióspermia.........................*Covered Seeds (capsuled).*

SECTION III.—Class 15. *Tetrádynámia*, has its Orders from a difference in the shape of the seed-vessel.

1. Siliculósa.........................*Pod a Silicle (a broad pod).*
2. Siliquósa.........................*Pod a Silique (a long pod).*

SECTION IV.—Classes 16. *Mono'delphia*; 17. *Diade'lphia*; 18. *Polyade lphia* (for Class 19 *vide* Sect. V,); also Class 20 *Gyna'ndria*, have their Orders taken from the number of stamina: thus—

1. Monandria ....1. Stamen.	6. Heptandria .... 7. Stamina.
2. Diandria ....2 Stamina.	7. Octandria............ 8. Ditto.
3. Triandria ....3. Ditto.	8 Decandria, &c. to 10. Ditto.
4. Pentrandia. ....5. Ditto.	11. Polyandria . ...Many Stamina inserted in the receptacle.
5. Hexandria ....6. Ditto.	

Note.—Here the pistilla, seed, or seed-vessel, furnishes no subdivisions; hence the necessity of having recourse to the number alone, and number with insertions of the stamina.

SECT V.—Class 19. *Syngene'sia*, has its Orders taken from the nature of the flower, and to understand this well it will be necessary to show it by analysis:—

FLOWERS.—COMPOUND.

Each Floret having no peculiar Calyx.

ORDERS.

All the Florets alike ....1. Polygámia Æquális.

Florets diversified.

Bisexual in the disk, perfect ...Pistil flowers in the ray, perfect....2. Polygámia Supérflua.
Ditto, imperfect. ...3. Polygámia Frustránea.
Bisexual in the disk, imperfect Ditto, perfect....4. Polygámia Necessária.
Each floret having a peculiar calyx.. ....5. Polygámia Segregáta.

SECTION VI. Classes 21, *Monœ'cia*; 22. *Diœ'cia*, take their Orders from the number, and other peculiarities.

1. Monándria.........................1. Stamen.
2. Diándria.........................2. Stam na, those classes subdividing the preceding, to
3. Gynándria.........................Stamina arising from the pistillum.
4. Syngenésia.........................5 Anthers united.

Note.—As we descend with the Classes, they have the pre-eminence of those placed above them; and hence what would otherwise have become Classes, become Orders, with the classical appellation.

SECTION VII.—Thus in Class 23, *Polyga'mia*, we have Orders.

1. Monœ'cia................ 1. *Habitation.*
2. Diœ'cia................ 2. *Habitations.*
3. Triœ'cia................ 3. *Habitations.*

SECTION VIII.—Class 24, *Cryptogamia*, has four Orders.

1. Filices .... *Ferns.*
2. Musci .... *Mosses.*
3. Algæ .... *Sea Weeds.*
4. Fungi .... *Funguses.*

Having thus given this view of the Classes and Orders, the following remarks may be found useful to the young botanist, who will, understanding what he has read, endeavour to ascertain the Class and the Order of some plant that he has met with. At the first step he must make two '*Comparisons.*'

I. Whether the sexes are "visible," or
II. Whether the sexes are "invisible.

That is, *whether* the *naked eye* can *discern* the *Pistillum* and *Stamina*, or not.

If "the sexes are not visible," he has already reached the object of his destination, the plant whose fructifications he holds in his hand, comes under CLASS XXIV. "*Cryptogamia*" of Linnæus.

If on the reverse "the sexes were visible,"—that is, the *Stamina* and *Pistilla* apparent to sight—he has now three *Comparisons* to make, which may be called the "*second stage*" of his journey. He has carefully to examine,

I. Whether the flowers are "Bissexual,"
II. Whether the flowers are "unisexual," or
III. Whether the flowers are "mixed."

By "Bissexual" plants are understood such, whose *flowers* have their *Stamina* and *Pistilla* (the *male* and *female parts* of *Plants*) inclosed within the *same corolla*.

By "Unisexual," such as produce *flowers* with the *Stamina* and *Pistilla* placed in *different corollas*.

And by "Mixed," is to be understood a *mixture* of the *two kinds of flowers*, "Bissexual," and "Unisexual."

Having made the necessary examination, if the sexes are "Mixed," he is at once arrived at his journey's end, his plant is in CLASS XXIII. "*Polygamia.*"

If "Unisexual," he has one of two roads to take,

I. The two Sexes are either "on the same plant," or
II. The two Sexes are "on different plants."

That is, Stamen-bearing flowers (*male* flowers) and Pistil-bearing flowers, (*female* flowers) are in the former instance to be found on the *same* plant, produced from the *same* root,—and in the latter case, the correspondent *male* and *female* flowers, are found on *different* plants, produced on *different* roots.

His plant being as the directing post, he reads the botanical inscription, and discovers his plant to come under the CLASS XXII. "*Diœcia*," or CLASS XXI. "*Monœcia.*"

But if the flower was Bissexual, he has another course to take, and he has to see,

I. Whether the "Anthers" are "separate," or
II. Whether the "Anthers" are "united."

If he finds five "Anthers united" round the *Pistillum*, he has reached the object of his destination, namely CLASS XIX. "*Syngenesia.*"

If the "Anthers" were "separate," he has to advance a "*fourth stage*," and to see,

I. Whether the "Filaments" are "separate," or
II. Whether the "Filaments" are "united with each other," or
III. Whether the "Filaments," are "united with the pistillum."

If the *Filaments arise* from *any part* of the *Pistillum*, or from a *pedicle* (column) *elevating* the *Pistillum*, the plant is then of CLASS XX. "*Gynandria*."

If the "Filaments are united with each other," (these being joined together at bottom as a membrane), they are either,

I. All of them united, "forming one body," or
II. Divided into "two parcels," making two bodies, or
III. Divided into "three, or more parcels," each parcel being united.

If united together, but forming "three or more parcels," the flower falls under CLASS XVIII. "*Polyadelphia*,"—if forming "two bodies," under CLASS XVII, "*Diadelphia*," and if only "one body," under CLASS XVI. "*Monodelphia*."

But if the "Filaments" were "separate," he has to examine,

I. Whether these are "proportionably long," or
II. Whether these are of "different lengths."

Of different lengths relate only to *four or six stamina*.—If his flower has "six stamina," and of these he finds, "four long and two short," he has reached his destination, CLASS XV. "*Tetradynamia*;"—if "four stamina," "two" of these "being long" and "two short," he discovers his plant to be of the CLASS XIV. "*Didynamia*."

If his flower falls under none of the former considerations, he has an easy task now assigned him, only to count "numbers;" but if these amount to "twenty or more stamina," he has also to attend to "*insertion*."

I. Whether "inserted on the calyx or corolla," or,
II. Whether "inserted on the receptacle."

If "inserted on the receptacle," the CLASS is XIII. "*Polyandria*,"—and if on the calyx or corolla, CLASS XII. "*Icosandria*."

The other comparisons are equally easy, as—

CLASS XI. "*Dodecandria*, twelve to nineteen stamina."
CLASS X. "*Decandria*, ten stamina."
CLASS IX. "*Enneandria*, nine stamina."
CLASS VIII. "*Octandria*, eight stamina."
CLASS VII. "*Heptandria*, seven stamina."
CLASS VI. "*Hexandria*, six stamina."
CLASS V. "*Pentrandria*, five stamina."
CLASS IV. "*Tetrandria*, four stamina."
CLASS III. "*Triandria*, three stamina."
CLASS II. "*Diandria*, two stamina."
CLASS I. "*Monandria*, one stamen."

CHAPTER IV.—*Illustrations of the several Classes and Orders.*

The next subject to be brought before the notice of the reader consists of some illustrations of the Classes and Orders; in presenting which an opportunity will be afforded of noticing some very interesting facts, and also of explaining some very useful botanical terms in mentioning some of the GENERA and of the SPECIES.

Belonging to the first class, a few plants grow naturally in Britain: they grow principally in marshes. The Hippuris Vulgaris (mares tail) may be mentioned as an example.

Belonging to the second class, and to the first order, is the privet. To the same division, that beautiful little flower, that adorns our meadows and hedges, and emblems well, beautiful and elegant innocence, called Germander Speedwell, a species of Veronica, belongs. The enchanter's nightshade (Circæa lutetiana). Circe is most likely known to our readers as the lady who changed the companions of Ulysses, the Grecian warrior, into swine. The jasmines, the lilacs, rosemary, sage, the olive among the Romans the emblem of peace, belong to this class.

In the third order of this class is pepper, an article the uses of which most are aware.

The third class (Triandria) is peculiarly interesting, as containing, in its second order, the family of the GRASSES. Wheat, rye, oats, barley, belong to this class. It is a curious fact, in relation to grasses, that the more the leaves are consumed, the more do the roots extend. And it is further asserted by naturalists, that animals are endowed with a discriminating power in respect to the foliage and the flower of the grasses, that, if left to themselves, they will leave untouched the *culm* (as the stalk of grass is called), thus allowing the seed to become ripe, and to fall at its proper time, and consequently to be sown. And what, as Dr. Thornton remarks, is still more interesting, that on lofty mountains, where the summer heats are hardly sufficient to ripen the seeds, the grasses there are *viviparous*, that is, they propagate themselves by bulbs without seeds.

The sugar-cane, which has by the wickedness of man been the source of so much misery to the poor negroes, belongs to this class.

The fourth class, Tetrandria, is interesting as embracing a natural family of plants, namely, the STAR-LIKE (Stellatæ). These are so named from the manner of the growth of the leaves, which, being in sets around the stalk, form the appearance of stars, each set regularly rising one above the other. As an illustration of this class, and of the beautiful appearance produced by this arrangement of the leaves, the asperula odorata may be noticed. This lovely plant grows in the woods, and has the peculiar property of giving out, when nearly dead, a most delightful odour: hence its name. It is a sweet plant, so delicate, and emblems the virtues of a good man, the goodness of which shines most often after he is dead.

To this class, and to the first order, belong the fullers' teasel, so called because this species of teasel is used by clothiers to raise the nap of woollen cloth. The leaves of this plant embrace the stem, being so closely arranged as to form a kind of basin around the stem: leaves thus arranged having received the name of *connate*. This plant is called, botanically, Dipsacus, from a Greek word signifying *thirst*, because, in the basin formed by the leaves, it receives and stores up the rain for times of drought. This plant has its flowers collected in a round ball, so as to form a cluster, which is called a *head*. Belonging to this class is the devil's-bit, (Scabiosa succisa), which is so named from its root having the appearance of being bitten asunder: an operation which, it is said, the devil performed upon it to deprive it of its virtues.

These plants noticed belong to the first order. To the third order belongs the holly, which pleases us at every season of the year. Williams, who writes an interesting work on the climate of England, recommends very much that hedges to fields, corn-fields in particular, should be made

of holly, as not harbouring insects so much as quickset; and also as affording an equally good defence both in summer and in winter. Alderman Atkins has surrounded his estate, a part of which forms one side of the main road through Kent to Sevenoaks, with holly hedges; they seem to be prospering, and it is hoped the experiment will succeed, since holly must form a very hardy hedge.

Belonging to this class we have some flowers which are called AGGREGATÆ. The flowers so named have several flowers contained within one common calyx, and, in this respect, resemble the COMPOUND flowers, differing from the latter, however, in having four distinct stamina, the anthers and the corolla above the germen.

The fifth class, Pentandria, contains a very great variety of plants. Those having rough leaves, a very abundant family, and from this circumstance placed under the order of ASPERIFOLIÆ, come under the class Pentandria. Many poisonous plants are arranged under this class, which, having a peculiar lurid colour, form the natural family of the LURIDÆ. Plants which bear flowers on stalks spreading forth from the top of the stem in the form of rays (a form of flowering called an *umbel*) belong to this class. Such flowers are called UMBELLIFEROUS flowers. Indeed, the class Pentandria is very numerous, comprising, as Miss Kent observes, "nearly a sixth part of the vegetable world." The Forget-me-not (Myosotis palustris) belongs to this class. It is a lovely plant, having a little blue flower, and is regarded in Germany as the emblem of affection. The hedge convolvulus belongs to this class; the shepherd's weather glass, so named from closing its corolla when rain is coming; the bittersweet (Solanum Dulcamara); the potatoe, said to be brought into Ireland by Sir Walter Raleigh; the deadly nightshade (Atropa Belladonna); the woodbine; the delicate heath-bell; the violet; the ivy, the currant-bush. With regard to the last it may be remarked, that the mode of flowering belonging to the currant constitutes what is called a RACEME. "The umbelliferous plants," observes Dr. Thornton, "in dry situations are aromatic and carminative: in moist ones, acrid and sometimes poisonous. The greatest virtues are contained in the seeds and the roots. Many of them are eaten at our tables, as the roots of carrot and parsnip, and the stalks of celery. The seeds of coriander and caraway are used in confectionary."

The sixth class, Hexandria, contains the natural tribe of the lilies (Liliaceæ). The plants belonging to this class have generally bulbous roots, some of which are injurious: some are used in medicine; and some are rendered fit for domestic use, as the garlic (allium) by heat.

The seventh class, Heptandria, contains in its first order, Monogynia, the splendid tree the horse-chesnut (Æsculus Hippocastanum). The fruit of this tree contains a large quantity of nutritious matter; and, when boiled, it seems to form an excellent article of food for pigs, deer, and (it has been presumed) man.

To the eighth class, Octandria, the interesting family of heaths belongs.

To the ninth class, Enneandria, the laurel, that which formed the chaplet of victory to the conqueror at the Olympic games, and that which, from this circumstance, has become the emblem of praise, belongs. A writer on education, referring to the influence of praise as a motive to industry more powerful than the influence of fear, observes—"In our institution we prefer the *laurel* to the *birch*." The laurel forms a very beautiful and durable hedge; care should be taken not to allow the shoots to run too

high at first: otherwise the hedge will lose its beauty in a few years, from the stems being without leafy shoots.

To this class, also, the rhubarb plant is referred.

The tenth class, Decandria, comprises the rue (Ruta), the strawberry tree (Arbutus), the splendid pink (Dianthus), the stone-crop, the wood sorrel, (oxalis acetosella), and that beautiful spring flower, the meadow pink (Lychnis). There is one circumstance to be remembered in reference to the rue. Several peculiarities in reference to the stamens were noticed in the chapter on these parts. one further may now be noticed in reference to the stamens of this plant. The stamens " are very stiff, and cannot be disturbed from the posture in which they happen to be: but, nevertheless, they rise by a spontaneous movement, one or two at a time, and lean over the stigma till the pollen be shed, when they fall back again, and give place to others.

The eleventh class comprises the asarabacca (Asarum), the powder of which is sometimes used as a snuff.

The twelfth and the thirteenth, it will be remembered, differ in the part where the stamens are inserted: these in the twelfth, Icosandria, being situated on the petals, or on the sides of the calyx, whereas in the thirteenth class, Polyandria, these important little parts are affixed to the receptacle. It is of considerable importance to bear this distinction in mind; because fruit-trees bearing fruits that may with safety be eaten belong to the icosandrous class, whereas the plants belonging to the polyandrous class are for the most part poisonous.

The fourteenth class, Didynamia, contains the natural family of the Ringent flowers, from ringere, to *gape;* an appearance clearly seen in the lamium album, or white nettle: the border of the corolla, or flower, is divided into two parts, the *upper lip*, called also by some the *helmet*, and the *under lip*, called by some the *beard*, and the opening between, the *hiatus* or *gape*, the entrance into the tube is called the *throat*, and the upper part of the tube the *neck*. Ringent flowers often are placed round the stem, which is square, in the form of what are called *whorls*. Such flowers are called *verticillate* (verticillus, a whorl). This class contains also the natural family of the Personatæ, in which the two lips are closed, and consequently there is no hiatus, or gape.

The verticillate plants give out, generally, a strong and pleasant smell.

The fifteenth class, Tetradynamia, contains a very interesting natural family, (Cruciferæ) namely, plants having the petals, or corolla, in the form of an X; these petals being fastened to the receptacle within the calyx by a pale narrow part called the *claw*, or *unguis*. The plants belonging to this class are generally stimulating, and are said by Dr. Thornton to be antiscorbutic. The horse-radish, the turnip, and the mustard belong to this class: also several other plants, which are highly serviceable to man.

The sixteenth class, Monadelphia, contains the natural family of the Column-bearing plants, so named because the receptacle, having affixed upon it the united filaments so as to form one body, stands up as a column in the centre of the flower. The mallow will afford a very good instance of this class, especially as it is easily obtained. Almost all the mallow tribe are characterised by containing a considerable quantity of nutritious, mucilaginous matter.

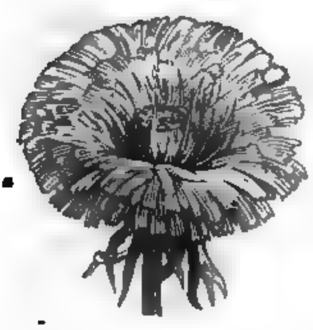
The seventeenth class, Diadelphia, contains another natural family, all of which have flowers something resembling a butterfly, hence called Papilionaceous, papilio, meaning a butterfly. The flowers of plants,

belonging to the papilionaceous tribe, are composed of several parts, the pea will afford a good example: the petals are four: the upright one is called the *banner;* the side petals are named the *wings*, and the under one the *keel.*

Most of the plants belonging this class are nutritious, and afford food to man and to beast. The Laburnum, however, is poisonous, exciting vomiting. To this class the trefoil, the saintfoin, the lucern, and several others belong.

The pericarp or seed-vessel of a Papilionaceous flower is known by the name of a *legume;* whereas the seed vessels of the plants belonging to the class Tetradynamia are known by the names of the silique, and the silicle. It will easily be perceived wherein the silique and the silicle differ from the legume: the two former have an intermediate partition to which the seeds are attached, which partition does not exist in the legume, the seeds therein being placed alternately.

The eighteenth class, called Polyadelphia, comprises the family of the Hypericums, many of which, in a diminutive but most lovely condition, are to be seen on the Sussex Downs. The perforated Hypericum is a most attractive object.



The nineteenth class, Syngenesia, contains a very extensive natural family, called the COMPOSITÆ, because the flowers are *compounded* or made up of a number of small flowers or *florets.* When these little flowers are contained in or rather composed of tubes, they are called *tubular:* when, on the contrary, the little flowers are flat and linear, they are called *ligulate.* Of the former mode of flowering the thistle (Carduus) affords a good example: of the latter, the dandelion (*a.*) Leontodon Taraxacum. The daisy (Bellis) affords a very pleasing and well-known instance of a compound flower; the florets in the centre being styled the disk: those in the circumference the ray.

The twentieth class, Gynandria, contains the natural tribe of *Orchises*, *Orchideæ*, and the PASSIFLORÆ or *passion flowers.*

To the three next classes, Monæcia, Diœcia, and Polygamia, many of our most valuable trees belong: and to the last class, Cryptogamia, the beautiful mosses, the fungi, and a vast variety of plants.

Much more might be written upon the science of botany, on the characters of genera, of species, and of varieties, but this our room will not permit: and sufficient perhaps has been already communicated to induce some to enter upon the investigation of the interesting studies connected with plants, in the prosecution of which numerous works will be easily obtained to forward the inquirer. In conclusion, as one work ought to be noticed, let Smith's English Flora be recommended to our readers, as one rich in information, accurate in its details, and comprehensive in its plan.

And now the Essayist begs to take his leave, hoping that this introduction into this temple of the Deity, will lead the minds of his readers to admire, worship, and obey Him, who has clothed the earth with so many beauties, and has constructed it upon so wise a plan.

J. E.

BREWING.

1. *Definition.*—The art of Brewing consists in a knowledge of conducting that process, by which the saccharine, or sweet matter, contained in many vegetable substances may be extracted, and partly converted into spirit, or alcohol, by fermentation,—the addition of various substances for the purpose of giving flavour,—retarding fermentation after it has arrived at a certain point,—and the separation of the fermentable matter so perfectly as to leave the liquor clear. In this state it forms Porter, Ale, Strong, or Table Beer, according to the peculiarity of management, or the strength derived from the sweet matter.

2. *What knowledge necessary.*—A knowledge of the properties of the substances employed, and the principles of fermentation, together with a constant attention to the temperature and specific gravity of the wort, are essential to the certain and uniformly-successful production of good beer, combining, as it ought to do, the requisites of clearness, soundness, and that full measure of strength and flavour, which can be derived from the materials employed. Without this knowledge as a guide, the success of the process will be, at the best, but uncertain, since changes in the temperature of the air, variations of the weather or atmospheric pressure, may render modifications necessary, of which no judgment can be formed by positive rule.

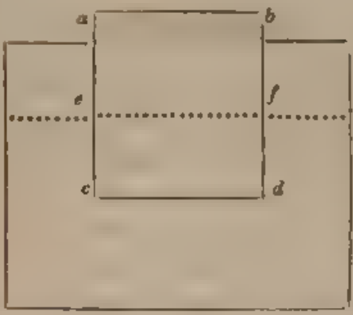
3. *Temperature and Gravity.*—The two points requiring the greatest attention are temperature and specific gravity.

4. *Temperature and Thermometer.*—It is unnecessary to explain what is meant by temperature; almost equally so, to describe that common instrument the thermometer, by which temperature is ascertained. The thermometer used in brewing should be of considerable size, and marked with large divisions; it should also be guarded by a tin case.

5. *Specific Gravity.*—Specific gravity may require explanation. The same bulk of different substances has a different weight. Thus a cubic inch of silver will weigh less than a cubic inch of lead, and a cubic inch of lead less than one of gold. In the same way different liquors weigh differently. A cubic inch of alcohol, or pure spirit, will weigh much less than a cubic inch of water, the water less than brine, &c. These comparisons are termed specific gravities, or relative weights.

6. *Saccharometer.*—When substances have been dissolved in water, they increase its relative weight or specific gravity, and instruments are used to ascertain what is the degree of increase, or in other words, how much of the substance has been dissolved. As sweet matter, or sugar, is the substance which is the object of the brewer's enquiries, his instrument is called the saccharometer or sugar measurer.

7. *Principle on which the Saccharometer acts.*—A few words will explain the action of this instrument. When a body is immersed in a liquid, it displaces, or puts on one side, a quantity of fluid equal to its own bulk, and the body thus immersed will sink or swim, according as it is heavier or lighter than the fluid it has displaced. Hence a body *a b c d* placed in a fluid will sink down, we will say, to the line *e f*, having by the immersion of the part *e f c d*, displaced exactly that quantity of fluid which, if weighed, would equal the weight of the whole body *a b c d*. And according as the body *a b c d* is lighter or heavier, in such proportion will it rise above or sink below the line *e f*.



Reverse this case: suppose the fluid to be altered, and the body *a b c d* to remain the same in weight, and it will be similarly affected as regards the distance to which it will sink in the fluid. For having, as before, to displace a quantity of fluid equal to its own weight, if, on the one hand, the fluid be lighter, a greater quantity must be displaced, and the body *a b c d* must sink farther; or, on the other hand, if the fluid be heavier, the body *a b c d* will not sink so far, because its own weight is equalled by a smaller quantity of the fluid. Such is the principle of the saccharometer; the instrument will next be described.

8. *Description of Saccharometer.*—The saccharometer may be made of various substances, is constructed with different degrees of accuracy, and varies in price from 10*s.* 6*d.* to £3 3*s.* That best adapted for domestic use, and coming at the lowest price, is Mr. Saddington's, of which the following is an account, taken from the Mechanics' Magazine:—"This instrument may be made either of copper or tin, in the shape of two concave hemispheres soldered together; or it may be made in the shape of two small funnels, or hollow cones, with the mouth or base of one inverted on the other, and soldered together: either of these forms will be equally accurate. The most convenient size for the ball of the instrument will be about three and a half or four inches in diameter, and of proportionate depth; about one inch of the under part of the ball or point of the cone must be cut off, and have a bulb attached to it, about one and a half or two inches deep, similar to the lid or top of a tea canister, for the purpose of containing shot, to poise the instrument in water. On the top of the ball must be fixed a tube or hollow stem, about four inches long, furnished with a cap to take off occasionally; on the top of the cap must be placed a small dish (similar to a small scale-pan), to hold the weights when the instrument is used. A small brass or copper ring, about one-eighth of an inch wide, must be fixed on the stem, about one inch above the ball, to be called the guage-point. The instrument must be hollow from the top to the bottom of it, and loaded with small-bird shot, by putting it down the tube or stem, until it sinks to the gauge-point. Then weigh the instrument out of the water, from which a table, from the following data, must be calculated, for ascertaining the specific gravity of malt liquor."

9. *Use of the Table to accompany Saccharometer, and how constructed.*—As when the instrument is purchased from the maker it should always be accompanied by a corresponding table, it might appear unnecessary to give the method of calculating one; yet, as the instrument can be made in the country by any tinman from the description and sketch

already given, it may be useful to some of our readers, who may reside at a distance from London. Looking back, then, to paragraph 7 (where the principle of the instrument is given), we find that in proportion as the density or weight of the fluid, into which a substance is put, is increased, the higher it will float in it, because the substance has to displace a smaller quantity to be equal to its own weight. Now, the gauge-point mentioned in par. 8, being that point to which the instrument will sink in water, it will plainly appear, that in proportion as the saccharine or other matters derived from the malt are present, in such proportion will it float higher than the gauge-point, inasmuch as they have increased the density or weight of the fluid. In order, therefore, to sink it down to the gauge-point, weights must be placed on the scale-pan; and, by referring to the table, we shall find how many pounds per barrel of saccharine matter are contained in the wort.

10. "We will suppose the instrument," says Mr. Saddington, "when sufficiently loaded with shot, to be immersed in cold water at a temperature of 60 deg., and to sink to the middle of the gauge-point on the stem, and the weight out of the water to be 10 oz. 10 drams. Then say, as 10 oz. 10 dr., the weight of the instrument, is to 360 lbs., the weight of one barrel of water (36 gallons), so is one dram to 2 lbs. 1 oz. 14 drs., the weight of saccharine matter contained in one barrel of 36 gall., when the instrument is loaded with one dram weight in the cup at the top of the stem. Then proceed in the same manner to form a table, to be used with common avoirdupoise weights of ½ dr. 1 dr. 2 drs. ¼ oz. ½ oz. and 1 oz. For an instrument of the weight supposed, the table would run thus:

Weight on the Instrument to sink it to the Gauge.	*Saccharine Matter to the Barrel of 36 galls.*	
Drams.	Lbs.	Oz.
1	2	1
2	4	3
3	6	5
4	8	7
5	10	9
6	12	11
7	14	13
8	16	15
9	19	0
10	21	2
11	23	4
12	25	6
13	27	8
14	29	10
15	31	12
16	33	14

11. *Information gained by the Saccharometer.*—We are thus enabled by the use of the saccharometer, to ascertain the goodness of the malt, to prepare a wort of any degree of density, or containing any requisite quantity of saccharine matter, and ultimately to bring the liquor during fermentation to any strength desired.

12. *Substances employed.*—The substances generally employed in the making of beer are water, malt, and hops. Beer may also be made from raw, or unmalted grain, sugar from the cane, parsnips, beet, stalks of Indian corn, and some of the sweet grasses. Other substances may frequently supply the bitter principle instead of the hop. On each of these substances we shall say a few words.

13. *Water*.—Water, either hard or soft, may be made use of, to extract the saccharine matter. Some persons prefer the one, and some the other. Both are of equal power in dissolving the sweet matter.

14. *Malted Grain*.—Unlike the juice of the grape, and some other vegetables, the meal of common grain requires to undergo a process before it becomes sweet. This process is called Malting. The grain is wet, vegetation produced, and after a period (which would vary according to circumstances, were it not for mistaken regulations, imposed by the legislature) it is dried on a kiln. It is now in a fit state for the brewers' use, and called malt. The grain most commonly malted is barley.

15.—*Raw Grain*.—Raw grain may be made to undergo what is called the saccharine fermentation, in the mash-tub, in a comparatively short space of time. This information is valuable to the private brewer. If one part of malt be mixed with two parts of raw grain, and mashed with water at a temperature of 155 or 157 deg., keeping the fluid as near as possible at that temperature by the addition of hot water, in the space of about two hours the whole will become saccharine, and the wort may be drawn off, and treated in the usual manner. Experience would probably lead to the use of a much smaller proportion of malt, since there appears no reasonable ground for supposing that the starch, or fœcula, of grain should not as easily be converted into saccharine matter as the starch, or fœcula, of potatoes, from which a wort may be drawn, with the addition of a very small quantity of malted grain.

16. *Sugar*.—But little consideration will enable the reader to perceive that the sugar of the cane is available for the purposes of the brewer, since it presents, in a convenient form, the saccharine matter he is at such pains first to develop, and afterwards to extract from grain. Cane sugar is, at present, too expensive for general use in brewing. Were nations actuated by a just and honest spirit in their commercial intercourse, sugar would, probably, be extensively used in the making of beer. Simple in the management of its fermentation, requiring but little apparatus to conduct the process, and becoming fine without trouble on the part of the operator, cane sugar offers many advantages over malt, and affords an excellent drink. Expensively burdened as cane sugar now is, it may still be used with advantage by persons residing at a distance from public breweries, and who desire to produce a beverage possessing a purity of taste, and lightness on the stomach. Directions for conducting a brewing with sugar will be found at the close of this article.

17. *Potatoes*.—Potatoes contain a considerable proportion of fœcula, or starch. This is the substance which undergoes a change during the process of malting grain, and is converted into sweet matter. A similar change may be produced in potatoes. Information on this subject has been chiefly derived from the French. M. Dubrunfaut gives an account, in the Transactions of the Royal Society of Agriculture for 1823, of an experiment in which a considerable quantity of rasped potatoes were put into a brewing tub, and boiling water poured on them, until the whole mass became a thick paste. A small quantity of ground malt was then added, and well mixed. The mixture soon became fluid and sweet, and a wort was drawn off. He then added hops, concentrated the wort by boiling, and submitted the liquor to fermentation. The result was a beer much resembling that of Paris, and had a fine vinous smell. We have had no opportunity of making a trial of this method of brewing, nor can

we determine what quantities of potatoes and malt will be necessary to afford a wort of a given strength. Dr. Hare, of Philadelphia, computes that five bushels of potatoes are equal to three bushels of malt, and the residue is applicable to the feed of cattle. The subject is worthy of attention, and we recommend its investigation to our experimental readers.

18. *Parsnips and Beet.*—As these contain a considerable quantity of sweet matter, they may, on the principles already stated, be used for the production of wort, and be fermented. The following, from the Mechanic's Magazine, is interesting, and deserves notice:—"The process of brewing is, to take as many of the roots as you choose to brew, wash them well, slice them across, and fill any sized vessel with them so cut; add as much water as the boiler will hold, and, if possible, lay a weight of some sort on the roots, to keep them under water; after boiling them about an hour and a half, they may be taken out, well broken and pressed, as the strongest part of the liquor remains in the roots. After they are well pressed, put the liquor that comes from them and the water they are boiled in together, and reduce it by boiling to any required strength, then put in what quantity of hops is thought necessary, and boil for one hour. Cool quickly, and ferment as usual." The result of a brewing from mangold wurzel will be stated hereafter.

19. *Indian Corn and Grasses.*—The stalks of Indian corn, and some grasses, may be treated in a similar manner. M. Hoffman made a decoction of fresh roots of couch, or dog's grass, cut and bruised, to which he added a little yeast and hops. From this he produced a tolerably palatable beer, which kept good for three months. Mr. Donovan, in his Domestic Economy, states that "Some years since, the Right Hon. George Knox and myself made a number of experiments on the interesting grass called fiorin. Among other subjects, we directed our attention to its fermentation. The method adopted was, to boil the grass in a large quantity of water; to strain it off, and boil down the decoction until it was sufficiently evaporated. Yeast being added, an active fermentation ensued, which lasted twenty-four hours." Mr. Donovan distilled this liquor, and obtained spirit. Had it been treated with hops, &c. as for beer, it would probably have answered. This grass is of very luxuriant growth; but how far it might be economical to use it as a substitute for malt, experiment can alone determine.

20. *Bitter Principle.*—Having thus enumerated various substances from which the sweet matter may be extracted, we come next to the consideration of the bitter principle. This is most commonly derived from the hop, which, in addition to the bitter it produces, is narcotic and stupifying. It is matter of doubt whether the hop possesses any preservative principle. The bitter is derived from a fine yellow powder, which may be separated from the leaves. The fine flavour, or aroma, of the hop does not exist beyond a twelvemonth; they then become old hops, give out nothing but the bitter, and are sold at a lower price. Hops are by no means the only bitter which may be made use of for preserving and flavouring beer: wormwood, bitter oranges, gentian root, and rind of seville oranges will afford a very good bitter. Gentian and quassia require to be used with great moderation, from the intensity of their bitter.

21. *Other Ingredients.*—It appears, by various convictions in the Courts of Law, that many other ingredients (prohibited by the legislature)

have been frequently used, viz. jalap, green copperas, or salt of steel, alum, lime, marble dust, oyster shells, plaster of Paris, nut galls, coriander seed, caraways, long pepper, capsicum, grains of paradise, ginger, cocculus indicus, nux vomica, and tobacco.

22. *Fermentation.*—The subject of fermentation must be next explained. Whilst some vegetable substances remain for years unchanged, others are extremely liable to spontaneous decomposition. The term fermentation is applied to the operation of the power of what is called chemical attraction, when exerted over dead vegetable matter. We have already said that vegetable substances are not equally subject to this change, nor is the change the same in all. Those most liable to fermentation are, starch, sugar, gluten and mucilaginous substances. Various kinds of fermentation take place, called according to the resulting product. Thus we have the formation of sweet matter, or the saccharine; the production of spirit, or the vinous; a third change into vinegar, or the acid; and a fourth, which totally decomposes the matter, and is called the putrefactive fermentation.

23. *Saccharine Fermentation.*—" The only substance," says Dr. Turner, the Professor of Chemistry in the London University, " known to be subject to the first kind (saccharine) of fermentation is starch." The meal of grain undergoes this change during the process of malting, already noticed in paragraph 14. Our business now will be with the vinous and acetous; to produce the due measure of the first, and avoid the commencement of the last.

24. *Vinous Fermentation.*—" The conditions," says Dr. T. " required for establishing the vinous fermentation, are four in number. The presence of sugar, water, yeast, or some ferment, and a certain temperature. The best mode of studying this process so as to observe the phenomena, and determine the nature of the change, is to place five parts of sugar with about twenty of water, in a glass flask, furnished with a bent tube, the end of which opens under an inverted jar full of water or quicksilver, and after adding a little yeast, to expose the mixture to a temperature of about 60 or 70 deg. In a short time bubbles of air begin to collect in the vicinity of the yeast, and the liquid is soon put into brisk motion, in consequence of the formation and disengagement of a large quantity of airy matter, the solution becomes turbid, its temperature rises, and froth collects on its surface. After continuing a few days the evolution of air begins to abate, and at length ceases altogether, the impurities gradually subside, and leave the liquor clear and transparent. The only changes we are able to notice as having occurred during this process, are, the disappearance of the sugar, and the formation of alchohol which remains in the flask, and of carbonic acid gas which is collected in the pneumatic apparatus. It admits of doubt whether any substance besides sugar, is capable of undergoing the vinous fermentation. The only other principle which is supposed to possess this property is starch; and this opinion rests chiefly on the two following facts:—1st. It is well known that potatoes, which contain but little sugar, yield a large quantity of alchohol by fermentation, during which the starch disappears; and, secondly, M. Clement procured the same quantity of alchohol from equal weights of malted and unmalted barley. Nothing conclusive can be inferred, however, from these data; for, from the facility with which starch is converted into sugar, it is probable that the saccharine may precede the vinous fermentation." Such is Dr. T.'s account of the vinous fermentation. Now

let us turn our attention to the acetous or sour fermentation, and we shall then be fully prepared to apply these principles to the fermenting tun.

25. *Acetous Fermentation.*—"When any liquid which has undergone the vinous fermentation, or even pure alcohol diluted with water, is mixed with yeast, and exposed in a warm place to the open air, a movement speedily commences, heat is developed, the fluid becomes turbid from the deposition of a peculiar filamentous matter, oxygen gas is absorbed from the atmosphere, and carbonic acid is disengaged. These changes, after continuing a certain time, cease spontaneously; the liquor becomes clear, and instead of alcohol, it is now found to contain acetic acid or vinegar. This process is called the acetous fermentation. The vinous may easily be made to terminate in the acetous fermentation; nay, the transition takes place so easily, that in many instances, in which it is important to prevent it, this is with difficulty effected."

26. *Attenuation.*—As soon as yeast has been added to the wort and fermentation commences, the specific gravity of the fluid begins to alter. Looking back to paragraph 24, it will be seen that it is the sugar which disappears during the vinous fermentation, and is converted into spirit, consequently the ultimate strength of the liquor, when fermented, depends on the sweetness of the wort; or, in other words, on the quantity of saccharine matter it contains. Dr. T., in page 24, has explained to us the changes which take place during the vinous fermentation, the resulting product of which is alcohol or spirit. Now this fluid is much lighter than water, and water is lighter than wort; a copious extrication of carbonic acid gas also takes place; hence, as soon as the formation of alcohol commences, the density of the fluid alters, and continues to do so until the whole of the saccharine matter is converted into spirit. This decrease of gravity is termed attenuation. Particular attention should be given to this part of the process of brewing, and its progress should be very frequently ascertained. This we are enabled to do by the use of the saccharometer. This instrument, as it has required weights to be added to sink it to the gauge point, when the saccharine matter is first dissolved, will require them to be removed according as the attenuation proceeds. It therefore furnishes us with a correct measure of the progress of attenuation, and the consequent change of the saccharine matter into spirit.

27. *Attenuation.*—We cannot do better in this place than quote again from the paper of Mr. Saddington, already noticed. "The density or weight of wort should be taken before the yeast is added to it, for as soon as fermentation commences, a reduction of density takes place and continues to go on, not only while the wort is in a state of active fermentation, but also after it is tunned into the cask, and even after it is bunged up, and still goes forward as long as any unattenuated fermentable or saccharine matter remains to be acted on, or until the acetous fermentation takes place, and the liquor becomes sour."

28. *Heat Influences the Gravity of the Wort.*—If the density of the wort is taken soon after it is drawn off from the mash tub, it will be considerably lighter than when it is cooled down to a proper heat for pitching or setting to ferment. If the wort is about 130 deg. of heat, you must add about five pounds to the density, to make it equal to the density when it is cooled down to 60 deg.; and if it is 120 deg., you must add four pounds to the density, as will be perceived by the following table:—

TABLE, shewing the density or weight of wort necessary to be added to the density of different degrees of heat, to make it equal to the density when cooled down to 60deg:—

Degree of Heat.	*Lbs. to be added.*
130	5
125	4½
120	4
115	3½
110	3
105	2½
100	2
95	1¾
90	1½
85	1
80	¾
75	½
70	¼

29. *Explanation.*—" Thus it will appear, that if the density of wort is eighteen pounds at 130 deg. of heat, you must add five pounds to it, as it will be twenty-three pounds density when cooled down to 60 deg. Again, if it is twenty-four pounds density at 110 deg. you must add three pounds to it, which will make it equal to twenty-seven pounds for the proper density, when cooled down to 60 deg."

30. *Mode of using the Saccharometer.*—" When the saccharometer is used, a deep tin jar will be very convenient to put the wort in, so as to prevent the instrument from being sunk, by overloading it with weights when placed in the wort in the tub. Having filled your jar with wort, place the saccharometer in it, and load it with the weights until it sinks to the gauge point, then look into the table for the number of drams in the cup of the instrument, and against them you will find the weight or density of the wort you are trying the strength of; and supposing such wort to require sixteen drams, or one ounce, to sink the instrument to the gauge point on the stem, the weight or density will be 33 lbs. 14 oz. by the table. Again, supposing the instrument supports twelve drams or ¾ of an ounce, such weight will indicate 25 lbs. density. Also if the instrument requires seven drams, it will indicate nearly 15 lbs. of saccharine matter contained in the wort, which may be considered as good family beer, that of 25 lbs. that of ale of sufficient strength for general use, and the 33 lbs. as very strong keeping ale."

31. *Attenuation.*—" The subject of fermentation or the principles of attenuation, is comparatively but little understood in private families; and indeed it cannot be duly appreciated or understood, unless by the application of the saccharometer. If the decrease of density is not carried on to a sufficient extent, the liquor will remain muddy, and always on the fret, or what is worse, it will enter into the acetous fermentation and become sour. On the other hand, if the attenuation is carried too far, either by being set to ferment too hot, or too much yeast added to it, the liquor will be driven forward with too much rapidity, rendering it greatly impoverished in flavour, by depriving it of the saccharine matter necessary to impart that peculiar rich fullness of flavour on the palate, so much esteemed in good home-brewed ale."

31. *Cleansing.*—" It is one of the most important advantages of the saccharometer to point out the progressive decrease of density during fermentation; and as soon as it has decreased to the required pitch, it must then be immediately tunned, or as it is termed cleansed. The following

40. *The Coolers.*—It is of great importance that the wort should be cooled down to the temperature suited for fermentation, as speedily as possible. If the wort were allowed to remain long at a high temperature, the acetous fermentation would soon commence. Coolers are shallow vessels, which, by exposing a large surface of fluid to evaporation, rapidly diminish its temperature. If you have brewed different kinds of beer from the same malt, you will want a cooler for each.

41. *Fermenting Tun.*—Here the first violent fermentation takes place. Its size should be proportionate to the other utensils, and if you are inclined to economise, the mash-tub will answer the purpose.

42.—*Casks.*—These should be well scalded and dried before beer is put into them; and should always be corked tight, so as to exclude the air when not in use. Those who are beginning to brew will do well not to trust to old casks; there is something gained in price, but very frequently more is lost by spoiling the beer.

43. *Other Articles.*—In addition to the above, the following articles are useful:—A horse-hair seive, to strain the wort from the hops after it has been boiled; a wooden funnel, a water pail or two, and a hand-bowl.

44. *Tabulating the Vessels.*—It will be very convenient to have tables made in the following manner, for ascertaining the quantity of fluid contained in the copper, under-back, &c.:—Procure an imperial gallon, fill it with water, and empty it into the vessel you wish to measure. When the water is still, dip into it a rod divided into inches and parts, and mark how much of this rod is immersed; note it down in a column headed with the name of the vessel. Do the same for every additional gallon, till the vessel is full. Follow a similar course with the other vessels.

COPPER,		UNDERBACK.		MASH TUB.	
Inches from top rim to water's surface downwards.		*From bottom upward.*		*From bottom upward.*	
Inches.	Gallons.	Inches.	Gallons.	Inches.	Gallons.
3	1	1	1⅛	1	2½
4	2	2	2½	2	5
4¾	3	3	4½	3	8
5¾	4	4	5⅞	4	10
6½	5	5	7¼	5	13
7⅜	6	6	8⅝	6	15

45. *Cleansing Vessels.*—Before operations are commenced, the utensils should be brought into good order, by soaking them with cold water, pouring in and rinsing them with boiling water, after which they should be dried. It sometimes happens through idleness that the vessels, having been laid by dirty, acquire a sour smell. The remedy, in such case, is, to throw in some quick-lime with the cold water, rinse the vessels, and allow the lime-water to stand some little time. Then pour out the lime-water, put in boiling water; steam, rince, and scour until the smell be removed. It is no credit to any brewer, either male or female, to be obliged to have recourse to this remedy. The disease is one of pure negligence, and whoever does not choose to pay the price of good beer, viz. care, attention, and cleanliness, must be content with such produce as his own sowing brings forth:—" Men gather not grapes of thorns, nor figs of thistles."

46. *Time to be chosen for Brewing.*—The time best suited for brewing

is a medium temperature, say about 50 deg. of the thermometer, with an atmospheric pressure of about 30 inches of mercury; or when the barometer stands at "Fair," or between that and "Set Fair." Changes in the air, producing stormy weather, are unfavourable to the uniform progress of fermentation.

47. In describing the manipulations of brewing, we shall take one bushel of malt as the quantity, and twenty gallons of beer as the resulting product. As the operations for every quantity are the same, our directions will be of general application.

48. *Mashing.*—Heat the water and pour a few gallons, boiling hot, into the mash-tub; allow it to remain ten minutes or a quarter of an hour, and then let it off. The object of this is, to warm the vessel, and to preserve the water at a full temperature. Now put in the malt. If you have the double bottom and pipe before mentioned, pour in ten gallons of water at a temperature of one hundred and seventy degrees. This temperature requires particular attention, for the following reasons. We have seen that it is the starch of the barley that undergoes the saccharine fermentation, much of this is left unchanged in the malt. It is a property of starch to dissolve and thicken in boiling or very hot water. Now, if the water be poured too hot on the malt, the starch will swell, absorb the water, and become so thick, that the saccharine part will not be dissolved, and the whole will be converted into a pasty mass from which no wort can be drawn. Whenthis happens, the malt is said to be set, the saccharine matter is locked up. On the other hand, if the water be not of sufficient temperature, the saccharine matter will not be extracted. Hence the point to be aimed at is, the use of water at a sufficient temperature to extract the saccharine matter, and yet not so hot as to convert the starch into paste. This is about 170 degrees. It may be varied five degrees above or below this, and experience will soon lead, by the use of the saccharometer, to the discovery of the temperature best suited for the purpose. The malt must now be well mashed or stirred for about fifteen minutes, at the end of which time ten more gallons of water should be added. This may be at a temperature of 180 or 185 degrees, as, after the malt has once been soaked, there is no danger of setting. The mash-tub should now be covered over and allowed to stand for a time, varying in practice from one to four hours. Each has his own time. Mr. Cobbett says two hours, Mr. Richardson four hours, for strong ale, and one mash; and if two mashes, three hours for the first, and two and a half for the second, &c.

49. At the expiration of the time allowed, the wort is to be drawn from the mash-tub. The vessel to receive it is placed under, and by turning the tap gradually, the fluid is allowed to run off. When it comes clear, return the muddy liquor that came off first to the mash-tub, taking care not to disturb the grains by pouring it in violently. Allow the whole to drain off, the wort will measure about ten gallons. When the water is taken out of the copper for the first mash, it should be filled again, and heated in readiness for the second. This second mash will take about fourteen gallons; the temperature may be somewhat higher than the first, say 190 deg. Stir well, and allow it to rest about one hour, or one hour and a half. Then draw off as before.

50. *Boiling.*—As short a time as possible should be allowed between drawing off the wort and boiling it; hence the great advantage of two furnaces, one for boiling the wort, the other for boiling the water. It not unfrequently

happens that if the wort be allowed to stand long in the under-back, the acetous fermentation commences, it becomes what the brewers call *blinked*, and contracts a disagreeable flavour. Several objects are accomplished by boiling. A considerable quantity of the watery part of the wort escapes in steam, by which the liquor is concentrated and becomes more dense. The wort also undergoes a kind of clarification. However clear the wort may be when first drawn from the mash-tub, there is always a degree of muddiness about it, occasioned, in all probability, by some vegetable matter similar in property to the white of an egg. During boiling (as is well known in the egg) this coagulates and becomes solid. If some of the wort be taken from the copper, in a basin or glass, after it has boiled half or three quarters of an hour, small lumps will be seen floating about in the fluid. The time of boiling is, in some measure, regulated by this breaking of the wort, as it is termed. We must now speak of the extraction of the bitter principle from the hop, which is another object of boiling.

51. The quantity of hops to a bushel of malt should be from three quarters of a pound to one pound and a half, according to the heat of the air, and the time it is intended to preserve the beer. The hops should be well rubbed and separated, as they are put into the boiling wort. If you are nice as regards the flavour of your liquor, boil the wort about an hour; then add the hops, and boil another half hour. This will, in general, be long enough; if the boiling be continued too long, you dissipate the flavour of the hop, and increase its bitterness. Attention should be paid to the breaking of the wort, mentioned in the last paragraph. After observing this two or three times, it will be easy to discover when the coagulation has taken place.

52. *Cooling.*—Before yeast is added to the wort, it must be cooled, and the more quickly this is done, the better. To accomplish this, it is drawn from the copper and poured through a sieve (to separate the liquor from the hops) into the flat shallow vessels, called coolers, already described. The rapid cooling prevents the commencement of the acetous fermentation, which would almost certainly take place if the liquor was allowed to remain in a large mass. By spreading it out over a considerable surface, evaporation is much increased, and in a comparatively short space of time it will arrive at a temperature suited for the commencement of the fermentation. At this period, the saccharometer must be used; but as we have, in par. 30, already given full information on its use, the repetition is unnecessary. The cooling may be hastened by putting into the hot wort, tin vessels filled with cold water. In breweries the wort is sometimes cooled by passing it through a series of pipes immersed in cold water.

53. *Pitching, or Setting.*—This term is applied to the mixing the yeast with the wort, after it has been cooled. The temperature is here to be attended to with great exactness, and somewhat varied, according to the density of the wort and warmth of the air. In summer the wort should be brought down to 60 deg., which is about the average temperature of June and July. In winter, when the air is at a temperature of 35 or 40 deg. you should not pitch lower than 70 or 75 deg. The quantity of yeast must be regulated by its quality; if good, one pint will in most cases answer for twenty gallons of the strength supposed, and at a temperature of 60 deg. It is always, however, best to do with as little yeast as will produce perfect fermentation; since it is better to have to quicken the

fermentation by an addition, than to hazard the spoiling of the wort by too violent an action. The yeast must be mixed as perfectly as possible; and in order to do this, it is usual to take a small quantity of wort in a bowl or bucket, at a temperature of 85 or 90 deg., and to pour the yeast into it. With this it is first mixed, and poured into the fermenting tun, when it should again be stirred. The tub should now be covered over with a sack or woollen cloth, and the fermentation allowed to proceed.

54. *Attenuation.*—The progress of attenuation should now be carefully watched, according to the principles already laid down under that head. The yeast will soon rise, and the tub, on being uncovered, will give out a fine vinous smell; as the fermentation proceeds, this odour will increase, while the colour of the yeast becomes darker. When the yeast has risen to its greatest height, it becomes more viscid, and at length begins to fall; and would, if left to itself, sink to the bottom. At this period it should be removed by skimming, the saccharometer should be used, and the attenuation noted. The skimming is continued until little or no yeast arises, and until you have reached the required point of density. If the fermentation does not proceed so rapidly as you could wish, instead of taking off the yeast, beat it into the wort, add a small quantity of flour and salt, beaten up in some of the wort, and then added to the tun. The temperature may also be somewhat raised by placing a chafing-dish in the room, or a large stone bottle filled with hot water in the wort.

55. *Cleansing.*—When the liquor has been brought to a cleansing density, it should be beaten up, and immediately separated into casks. By this, the fermentation is checked; it will, however, slowly go on: the casks are to be kept constantly full, and the yeast thrown up is discharged from the bung-hole. Separating the yeast from the liquor is not the only object of cleansing. On looking back to the paragraph on fermentation, it will be seen that if allowed to proceed unchecked, the whole of the saccharine matter will be decomposed; and, as a consequence of this, the acetous fermentation will commence, and convert the liquor into vinegar. By checking the progress of fermentation, by separating the liquor into casks, we secure a portion of the saccharine matter unchanged, while the yeast being continually thrown off, the cause of further alteration is lessened. When the yeast appears to be nearly exhausted, the cask should be stopped up close, and a vent-peg inserted. This should be sometimes loosened, to let off any excess of fixed air. In the course of three weeks or a month the liquor will be fit for use.

56. *Fining.*—If your brewing has been judiciously conducted, the operation of fining will be unnecessary to such beer as we have supposed to have been made. But should it not become clear so soon as you could wish, the process must be hastened by fining. Beer may be fined in many ways. The substance generally used is isinglass: this is to be dissolved in stale beer, carefully strained, mixed up with some of the beer from the cask, and then added to the whole. A small quantity, of the consistence of thin treacle, will be sufficient for a large cask. Alum has the same property; a few drams will serve for twenty gallons.

57. We have now given the necessary directions respecting the brewing of beer from malt and hops. There remain some details promised respecting beer from sugar and mangold wurzel.

58. *Beer from Sugar.*—" All the apparatus required is, a cask that has no bung-hole, or has it well stopped up. This is to be set standing on either of its ends, a cock is to be fixed in one of the staves, about one

inch above the bottom chine, so that in drawing off the liquor the sediment cannot also run. In the centre of the top of the cask a hole is to be bored. Let us suppose that the cask holds ten gallons, and the drink is to be tolerably strong ale. The proper quantity of hops required by this process, for ten gallons of ale, will be about a pound and a half: on this quantity, contained in any convenient vessel, pour eleven gallons of boiling water, or, what is much better, boil the hops in the water for about five minutes, and no more, then strain off the hops; in the strained liquor dissolve fourteen pounds of sugar, and mix in a pint of yeast of the best quality. Pour the whole into the cask, it will soon begin to ferment, it will throw up its yeast through the cork-hole at the top, and this being retained within the external rim of the chine, it will for the most part fall back into the liquor, and run back into the cask. It will require at the ordinary temperature of summer so much as three weeks or a month to complete the fermentation. For the last fortnight the cork may be generally kept in the hole; but it should, once every two days, be removed, to give vent to the fixed air, and then be replaced. When the fermentation appears at an end, the taste of the sugar will almost entirely have disappeared, it will be barely perceptible. The cork may then be permanently driven in, and in four days the ale will be fit for draught or bottling. The drink will spontaneously fine itself."—*Donovan's Domestic Economy.*

59. *Beer from Mangold Wurzel.*—" I took 150 lbs. of the roots, being the quantity my boiler would hold, boiled, bruised, and pressed them, adding one pound of hops, which I infused all night in some of the hot liquor, and by a saccharometer I have made, such as is recommended by Mr. Saddington, I reduced the liquor to the strength of about 28 lbs. of saccharine matter to the barrel of 36 galls. I then boiled the hops in the liquor one hour, cooled it as soon as possible to 70 deg. of the thermometer, and then added one pound of good yeast, let it stand twenty-four hours, then beat it in, and again in twelve hours; I then took off all the yeast I could, after letting it stand six hours. In six hours more, I again took off all the yeast and tunned the beer, allowing it to work well out of the barrel. When the working was finished, I put in a handful of the cold hops I reserved for the purpose, stirred them well in the barrel, and in a few hours bunged it down. The result is sixteen gallons of ale, apparently very strong, of a very fine flavour, and equal to any malt ale. The whole expence does not exceed seven shillings and sixpence, which is only 5¼d per gallon, for ale which would not disgrace a nobleman's table." *Mr. E. Watson in Mechanics' Magazine.*

60. It will be found very useful to record the progress and result of each brewing in a book kept for that purpose, stating the temperature of the air, the height of the barometer, quantity of malt and hops, temperature of the first and second mashing, &c. &c. During fermentation the progressive decrease of density should be stated, with any occasional remarks thought necessary. The following may serve as a pattern :—

July 17th, 1830.

MASHED FOR TABLE ALE.

Malt 1 bush. Hops 1½ lb. Thermometer 61 deg. Barometer 30¾ in.

Hrs.	*Min.*		*Galls.*	*Heat.*	*Galls. Wort*	*Gravity at 60.*	
7		Mashed	20	[illegible]			
9	30	Drew off					
						Lbs.	Oz.
10		Spent			10	21	2
		Run on	14	190			
11	30	Drew off					
1		Spent			14	12	11
10	30	First Wort in Copper					
12	30	Into Cooler					
1	30	Second Wort in Copper					
2	30	Into Cooler					

FERMENTATION.

Ten o'Clock pitched at 70 deg. with one pint yeast.

	Gravity.
July 17.	19.
18.	[illegible]
[illegible]	[illegible]
[illegible]	8.

Cleansed

Observations.

61. We believe nothing essential remains to be added. Should the success of the operator not be so perfect as he could wish, let him refer to his journal, compare the acts there recorded with the principles that ought to regulate his conduct, and he will probably, on consideration, discover that in some point he has misconducted the process. As far as our own experience has gone, there is however little uncertainty of success, provided the process be conducted in strict accordance to the principles we have laid down. We trust our readers will be fully rewarded for their trouble and patience in the perusal of this article, by being enabled to excel in the production of their favourite beverage, and to realize at their social festivals the imaginary description of the poet:—

When sated hunger bids his brother thirst
Produce the shining tankard, foaming high:
Forth may he bring the brown October,—drawn
Mature and perfect from his dark retreat
Of thirty years—whose flavour and whose strength,
Even with the vineyard's produce may compare.

BROCCOLI.

Broccoli (*Brássica Oleràcea, var: Bótry'tis*), Tetradynámia Siliquósa, Linn.; and Cruci'feræ, Juss.

Thirteen varieties of this useful and delicious vegetable have been described by Mr. Hugh Ronalds, in the third volume of the Transactions of the Horticultural Society. Miller, in his Gardener's Dictionary, supposes the few broccolis that were then known proceeded from the cauliflower, which he says was imported from the Isle of Cyprus; he mentions white and purple broccoli as coming from Italy. From these two sorts it seems reasonable to conjecture, have arisen all the subsequent kinds, either by accidental variations from seed, or by purposely mixing the farina of the different varieties. The following list contains

an account of those sorts which are now held in general estimation, describing them in the order in which they come to perfection for the table:—

1. *Purple Cape or Autumnal Broccoli.*—This has a close compact head of a beautiful purple colour, in general it is not very large, but if the season is showery, and it is planted in good ground, it will grow as large as a cauliflower. The leaves are nearly entire, erect, concave, lobed at bottom, and much waved, short and regularly surrounding the head; the veins and midrib are stained with purple, which stain is a test of its being true. The head is exposed to the view in growing; as it enlarges, the projecting parts of the flower show a greenish white, mixed with purple colour. When boiled the whole flower becomes green.

2. *Green Cape or Autumnal Broccoli.*—This sort differs but little from the preceding, except in colour, and in the heads, as well as the plants, proving in general larger. The leaves are long and narrow, much like those of a cauliflower, they are very little waved, and consequently, have a general appearance of smoothness; the veins and midrib are green. The head, which has some resemblance to a cauliflower, is of a greenish white colour, and is usually somewhat covered by the leaves. These two sorts are very sportive, running much into each other, and have a strong tendency to degenerate, yet are quite distinct, and when so, very beautiful. The greatest care should be taken in saving the seeds from plants which are perfectly true. This remark applies generally to all the sorts.

3. *Grange's Early Cauliflower Broccoli.*—The leaves have long naked footstalks, are wider and shorter than those of the green cape, are lobed at the bottom, but not much waved; the veins and midrib are whitish green. The head is large and quite white. The leaves covering the head defend it from slight attacks of frost.

4. *Green Close-headed Winter Broccoli.*—This is a new and good sort, probably a seedling from the green cape, which it closely succeeds in coming into use. Its peculiarity is, that it continues to bear during the whole of the winter, if the weather is mild. The plants are dwarf, leaves spreading and moderately indented; they are numerous, much waved, and large. The veins are white, the flower grows exposed, nearly resembling that of the Green Cape in appearance, and does not attain a great size.

5. *Early Purple Broccoli.*—A very excellent kind, of a deep purple colour; if true, it is close-headed at first, afterwards it branches, but is apt to come green and too much branched, especially in rich ground. Its height is from two to three feet, growing strong and tall; the leaves are much indented of a purplish green colour, they spread out wide, but not long, though the stalks are so; the head is quite open from the leaves; small leaves are sometimes intermixed with the head; the plants produce sprouts of flowers from the alæ of the leaves.

6. *Early White Broccoli.*—The heads of this variety are of a close texture, and of a pure white colour. It grows to about three feet in height, with erect, concave, light green, and nearly entire leaves.

7. *Dwarf Brown Close-headed Broccoli.*—From its resemblance, Mr. Ronalds supposes this variety to have sprung from the sulphur-coloured broccoli, from which, however, it differs by coming in earlier, as well as in the shape and colour of its head; the leaves are also shorter and broader than those of the sulphur-coloured broccoli; they are small, not much waved, dark green, with white veins; they grow upright, and do not cover the head at all. Most of the crowns are green on their first appearance, but soon change to large handsome brown heads.

8. *Tall Large-headed Purple Broccoli.*—This sort produces large tall purple heads, at two and three feet in height.

9. *Cream-coloured or Portsmouth Broccoli.*—This is a very noble sort, exceeding all the others in size. It is of a buff or cream colour, with a very compact firm head. Its leaves are large and broad, with white veins; they spread out widely, but the small centre leaves cover the flower. A head sent by Mr. Oldaker from Sir Joseph Banks to the Horticultural Society, on the 5th of May, 1819, measured more than two feet in circumference, although it was quite close.

10. *Sulphur-coloured Broccoli*—A hardy valuable sort, the leaves have long footstalks, much indented, and of a bluish grey colour. The heads are fine, compact, conical, and of a sulphur colour; some of them, however, are slightly clothed with purple.

11. *Spring White, or Cauliflower Broccoli.*—This sort, when planted in good ground, will produce very fine heads of a perfectly white colour. It grows very robust, with large leaves, flat and narrow, with thick veins; the leaves encompass and compress the head, so as to render it generally invisible when fit to cut, which is a great preservative from the frosty mornings, common in the spring months.

12. *Late Dwarf Close-headed Purple Broccoli.*—This is the latest purple broccoli, being in perfection throughout April and the greatest part of May. The plants seldom rise above a foot in height; the flower at first shows small and green, but soon enlarges, and changes to a close conical purple head; the leaves are short and small, dark green, with white veins, much insinuated, deeply indented, and forming a regular radius round the flower, giving the whole plant a singular and beautiful appearance.

13. *Latest Green, or Siberian Broccoli.*—This is the latest and hardiest of all the broccolis, for the severest winters will not destroy it. The leaves are much indented and undulated, long and narrow, with a tinge of purple colour in the stems.

Culture, &c.

Soil.

Broccoli in general succeeds best in a fresh loamy soil, where it comes more true in kind, and is hardier, without dung; but if this situation cannot be had, deep digging, with plenty of manure, is the only remaining alternative to procure good crops.

Propagated.

1. *By seeds.* All the sorts are propagated by seed, and for a bed four feet wide by twenty long, one ounce of seed will be required. The seed beds should be prepared of light rich mould, well dug, and if dry, watered the evening before sowing. The seeds must be thinly sown, and the beds thould be covered with mats or litter till the plants appear; the covering may then be removed, and the plants watered occasionally, as the state of the weather requires; should that continue very dry, the best method is to transplant, when the plants are about two or three inches high, into other beds, about four feet asunder. Being several times refreshed by sprinklings of water, they will, in a fortnight or three weeks, be sufficiently strong for another remove. This mode offers some advantage in giving time to clear off any crops of peas, &c.; thereby obtaining ground which could not otherwise be had at the first season of planting out. The first four sorts on the list should be only once transplanted, as the check their removal occasions, is apt to produce the heads prematurely, which, in that case, will be small, and indifferent in quality. If the season is showery, it will be needful to cover the beds as soon as sown with netting to keep off the birds; also to sprinkle the plants when they appear with lime water, or to strew on them fresh-slacked lime, to destroy the slugs. In this case, when the plants are six or eight inches high, they may be planted at such distances as recommended for each sort in the following table:—

Name of Variety.	*Time of Sowing.*	*When in Season.*	*Distances apart.*
1. Purple Cape, B. - - - - -	Middle May begin. and end of June - - -	August to Dec. - -	2 feet.
2. Green Cape B. - - - - - - - -	May, June - - - - - - -	August to November	2 feet.
3. Grange's early Cauliflow. B.	Begin. May, begin. and end June - - - - -	September to Xmas.	2 feet.
4. Green close-headed Winter B.	End of May - - - - - -	November to Feb.	18 inches
5. Early Purple B. - - - - - - -	April - - - - - - - - - -	November - - - - -	3 feet.
————	June - - - - - - - - - -	March and April - -	3 feet.
6. Early White B*. - - - - - - -	Feb. and begin. March. -		2 or 3 ft.
7. Dwarf Brown close-headed B.	Middle of April - - - - -	March and April - -	2 feet.
8. Tall large-headed Purple B. -	End of March - - - - - -	March and April - -	3 feet.
9. Portsmouth Broccoli - - - -	Middle April - - - - - -	February and April -	3 feet.
10. Sulphur-coloured B. - - - - -	April - - - - - - - - - -	April and May - - -	2 feet.
11. Spring White B. - - - - - - -	March - - - - - - - - - -	April and May - - -	3 feet.
12. Late Dwarf close-headed B. -	April - - - - - - - - - -	April and May - - -	$1\frac{1}{2}$ to 2 ft.
13. Latest Green B. - - - - - - -	End April - - - - - - -	May - - - - - - - -	2 feet.

* To obtain this variety fine and early, the seed should be sown on a slight hot-bed; the plants when about three or four inches high, must be transplanted into beds of light rich earth, three or four inches apart, and defended from the frost and cold nights by a mat covering. They will be strong enough to plant out by the end of April.

Plant.

1. *To preserve during winter.*—Although broccolis come larger and finer on the spot where they are planted, yet, as Mr. Ronalds observes,

it is certainly the most prudent way to take up at least a part of all the nine last-mentioned sorts in the beginning of November, disturbing the roots as little as possible, laying them in slopingly, with their heads towards the north, only a few inches above the ground, and about eighteen inches asunder. By this means, the crown of the plant lying low, is soon covered and protected by the snow, which generally falls previously to long and severe frosts; the plant is also rendered tougher in fibre, and hardier by the check received in this last removal.

2.—Mr. Knight, in the first volume of the Horticultural Transactions, observes, that in adopting the usual plan of laying in his broccoli plants in November, the heads produced in the succeeding spring were so small that he tried trenching, or laying them in, in the month of September, and so low that the centre of the stem at the top of each plant was level with the surface of the ground. The plants are watered, roots are properly emitted, and the earth drawn round each plant, before snow is apprehended. The consequence of this treatment is, that the plants are fresh and vigorous in the spring, *and produce large heads.*

3. *Diseases, Insects, &c.*—In old gardens, infected, as is often the case, with an insect which in summer insinuates itself into the roots of all the brassica tribe, and causes a disease usually called the *club;* trenching the ground deep enough to bring up from four to six inches of undisturbed loam or earth, will probably bury the insects too deep for mischief, and provide fresh ground for the benefit of the plants. Soap ashes dug into the ground in considerable quantities, Mr. Ronalds considers as a good preservative from the *club*, and if the roots of the plants just previously to planting, are dipped and stirred well into mud of soap ashes and water, its adherence will in a great measure preserve them from attack. A mixture of stronger ingredients, such as soot, sulphur, tobacco, &c. would probably be better still. In gardens much exhausted by reiterated cropping, if the mode recommended cannot be adopted, a good quantity of fresh loam, from a common or field, dug in, would materially improve the broccoli, and be of lasting use to future crops.

4. Previous to an expected frost, the market gardeners cut several of the sorts in considerable quantities, and keep them in sheds or cellars for the supply of the market.

USE.

For the table. The heads should be cut off, with about four or five inches of the stem, and the stalks peeled previous to boiling. After cutting, several of the sorts produce fine sprouts from the stems, which should be gathered when ready, and are, when boiled, but little inferior to asparagus.

BRUSSELS SPROUTS.

Brussels Sprouts (*Brássica oleràcea, sub. var. sabaudæ*), Tetradynámia Siliquósa, Linn.; and Crucíferæ, Juss.

This plant produces an elongated stem, often four feet high, from which are produced small green heads, resembling cabbages in miniature, each being from one to two inches in diameter; the whole ranged spirally along the stem, the main leaves of which drop early. The top of the plant resembles the savoy, when planted late; it has a small heart, which, according to Van Mons, is very delicate when dressed, and quite different in flavour from the sprouts.

Culture, &c.

SOIL.

Prefers a light rich loamy soil.

PROPAGATED.

1. *By seeds*, sown in spring under a frame, so as to bring the plants forward: they are then transplanted into an open border with a good aspect. "By proper attention and management, by late and successive sowings, we contrive," says Van Mons, (Hort. Trans. vol. iii.) "to supply ourselves with this delicious vegetable, in Belgium, full ten months in the year; that is, from the end of July to the end of May.

2. One ounce of seed will be sufficient for a seed-bed four feet by ten.

PLANT.

1. Should be planted at distances of eighteen inches apart.

2. We usually, says Van Mons, cut off the top of the plant about ten or fifteen days before we intend to gather from the stem, which then produces most abundantly, so much so, that if this vegetable be compared with any other, which occupies as little space, lasts as long, and grows as well, in situations generally considered unfavourable, such as between rows of potatoes, scarlet runners, or amongst young trees, it must be considered superior in utility to most others.

3. In spring, when the shoots are disposed to run to flower, their growth may be checked by taking up the plants and laying them in the ground in any shady spot.

USE.

1. The sprouts are used as winter greens, and are very nice and delicate.

2. Beside the usual mode of dressing them, the sprouts are sometimes served at table with a sauce composed of vinegar, butter, and nutmeg, poured upon them hot after they have been boiled.

BUCK-WHEAT.

Buck-wheat (*Poly'gonum fagopy'rum*). Octandria Trigy'nia, Linn.; and Polygoneæ, Juss.

Buck-wheat is an annual fibrous-rooted plant, with upright flexuose leafy stems, generally tinged with red, and rising from a foot to eighteen inches in height. The flowers are either white or tinged with red, and make a handsome appearance in July; the seeds ripen in August and September.

Culture, &c.

SOIL.

Will grow in any light poor soil, but does not thrive on a stiff clay, or wet land. It will only produce a *good crop*, on a soil that is light and rich.

PROPAGATED.

1. *By Seeds*, sown broadcast, not earlier than the last week in April or the beginning of May, as the young plants are very apt to be destroyed by frost.

2. A bushel of seed will be sufficient for an acre, which should be harrowed in; and in its subsequent culture, the larger seeds must be removed, and the crop protected from birds till the reaping season.

PLANT.

1. The plant is harvested by mowing in the manner of barley. After it is mown, it must lie several days, till the stalks be withered, before it be housed. It is in no danger of the seeds falling, nor does it suffer much by wet. From its great succulency, it is liable to heat, on which account it is better to put it into small stacks of five or six loads each, than into either a large one or a barn.

2. The produce of the grain of this plant may be stated, upon the average, at between

three and four quarters per acre; it would be considerably more, did all the grains ripen together; but that never appears to be the case, as some parts of the same plants will be in flower whilst others have perfected their seeds.

USE.

1. The seeds are excellent food for domestic poultry, and for pheasants. Their copious *albumen* affords a palatable and wholesome meal, which makes very good cakes called crumpets, which are not apt to create acidity in the stomach.

2. Horses are said to thrive on it: Mr. Young says, that one bushel of the grain mixed with four bushels of bran will go farther than two bushels of oats, and will be full feed for any horse for a week.

3. This corn made into meal, (according to Young) will fatten a hog in a very short time, with the addition of a small quantity of cracked Indian corn or peas, and plenty of water. It will be found that eight bushels of buck-wheat meal will go as far as twelve bushels of barley meal. The meat from this food will be superior.

4. The blossoms of this plant afford a rich repast to bees, containing much honey; and that, too, at a season of the year when the meadows and trees are stripped of their flowers.

BUDDING.—*See* GRAFTING.

BUSHEL.—*See* MEASURE.

CABBAGE.

Cabbage (*Brássica olerácea*), Tetradynámia Siliquósa, Linn.; and Crucíferæ, Juss.

This plant is too well known to every person, and its use too universal, to render any general description of it necessary. The varieties of this plant are so numerous, that it will be advantageous to divide them into two classes, the one adapted for *field cultivation*, the other for the *kitchen-garden*.

FIELD CABBAGES.

In the field culture of cabbages, several sorts are capable of being employed; but those varieties that are the most useful as cattle food, and the most capable of withstanding the severity of our winters, are the following:—

1. *Scotch Cabbage.*—This variety, when true, is capable of resisting the severest frosts.
2. *Great Drumhead.*—A very hardy variety, close in its texture, and very heavy in proportion to its size.
3. *Great American.*—A large variety, and continues good till late in the spring.
4. *Large Round Winter* Cabbage.

Other varieties are occasionally employed, as the York, Sugar-loaf, Savoy, &c.

Culture, &c.

SOIL.

All the varieties will thrive well on any rich soil. The most friable loam and loamy clays, on which turnips cannot be grown to advantage, are probably the best adapted to this sort of crop; but they may be raised with success on almost any of the heavier descriptions of land.

PROPAGATED.

1. *By Seeds.*—The seed may be sown in beds fourteen or fifteen feet in length, and five or six in width, composed of finely-pulverized rich and well-manured earth; it must not be sown too thick. An ounce, or an ounce and a half, will be sufficient for a bed of the dimensions described, which will afford two or three thousand good plants. Half a pound of seed will afford more plants than are sufficient for an acre.

2. *Time of Sowing.*—The proper periods for sowing depend much upon the intentions of the cultivator; where the produce is to be consumed during the winter months, as in December, January, and February, the seed should be sown in July the preceding year; but if it be intended for consumption in March, April, or May, the seed should be sown about the latter end of February or beginning of March, in the former year. By continuing to sow with regularity in the months of February, May and July, or August, successive crops of young healthy plants may be secured, and the round of cabbage-husbandry be effectually preserved.

PLANT.

1. *Method of Planting.*—In the planting out of this sort of crop, care should be taken to have the business performed as soon as possible after the land has been well saturated with rain; as in this case the plants much sooner establish themselves in the soil, and fewer vacancies are left by their decay to be afterwards filled up. The plants are likewise much more readily raised from the seed beds, and with much less injury to their roots, which is a matter of more importance than is generally supposed. The business is performed upon the land when in its flat or level state, and also when raised into ridges by means of the plough; but the latter method is the more general, and ought probably to be preferred whenever the soil is much inclined to the retention of moisture. On the lighter and more dry soils, the flat surface may, however, be more advisable

2. *The Distance of Planting* must depend in a great measure upon the strength and goodness of the soil, and the natural size of the variety of cabbage that is employed; but in general it should be such as that the ground between them may be cultivated and kept clean by the plough, and yet admit of becoming a full crop. It is obvious that where the plants stand thin they will attain a larger size, while in close planting there will be a greater number upon the land, which may compensate the disadvantage of want of size. It is the practice of some districts where this culture is well performed, to set them out regularly, at the distance of three feet each way; as in this method the plough in cleaning and earthing up the crops can be conducted both in a longitudinal and cross direction, and of course the soil between the plants be not only stirred in the most effectual manner, but the most completely laid up to the roots of the plants, and their growth the most fully promoted. Where the larger varieties of cabbages are employed, and the land is sufficiently strong, this may therefore be the most advantageous distance; but where the smaller varieties are made use of, and the ground is of a less strong and rich quality, two feet and a half may be the most proper distance.

3. *In setting the young plants out in the ground,* it is necessary to see that the labourers fix them well in the soil, by applying the mould so firmly round their roots, by means of the dibble, that they cannot be easily drawn out by taking hold of their uppermost leaves. The plants are mostly dropped at proper distances by women or children, and the dibblers follow, having a stick for marking the distances in an exact manner. In this way, an ordinary labourer will plant a quarter of an acre, or more, in a day and an expert gardener nearly as much more. In the course of a fortnight or three weeks after the first setting out of the plants, it will be requisite to fill up the vacancies that have been produced by the failure of particular plants; in performing which, a moist time, if it be possible, should be chosen.

4. *The season for planting,* for a full crop of field cabbages, is usually March; but cabbages may be planted as late as June, and produce a tolerable crop by November; and in this way they may sometimes be made to succeed an unsuccessful sowing of turnips.

5. *After culture.* There is scarcely any sort of crop that derives more advantage from having the mould, or soil, frequently stirred and applied to the roots of the plants, than the cabbage. It is only by a due repetition of those operations, that the plants attain their most perfect growth and size. The work is accomplished by means of ploughs, and horse and hand hoes. Where the plants are set out in a regular manner, at sufficient distances, the business may be performed in the most cheap and effectual manner by the use of the horse hoe, or the common light swing plough; but where narrow distances are employed, this work can only be well executed by means of the hand hoe. Sometimes both horse and hand hoe are made use of, as where the crop is planted close in the rows, with wide intervals. The number of hoeings must, in general, depend upon the state of the land, and the nature of the season; but three will, in most cases, be necessary. The first should be given about three weeks or a month after planting, according to the growth of the plants; and the second at about an equal distance of time. The third may be repeated as the necessity of the crop may require, attention being constantly paid to keep the land free from weeds, and the earth, or mould, well loosened and laid up to the plants. In the first operation it is usual to turn the mould or soil from the plants; but, in the subsequent ones, to apply it up to them, which, where the plants are set out regularly in squares, at the distance of three feet, may be performed in both directions of the ground in the most perfect manner.

USE.

1. Generally employed for feeding of milch cows, for which purpose they are always confined to farm-yards, and not suffered to eat them after being scattered on the ground. In this method of application they have been shown to be more beneficial than hay, given in any proportion, when only combined with straw; care, however, must be taken to remove all the outside decayed leaves, otherwise they will impart an unpleasant flavour to the milk and butter.

2. In the fattening of neat cattle, an acre of good cabbages may be nearly sufficient for three beasts of from forty to fifty stone each, which have been grazed in the pasture during the summer. A middle-sized bullock, in general, consumes of this sort of food in the proportion of about 100lbs. in twelve hours.

3. Half an acre of cabbages will be nearly sufficient for one hundred sheep, when the crop is good: a sheep consumes about 10 or 12 lbs. in twelve hours.

Garden Cabbage.

Garden Cabbage (*Brássica olerácea, var. capitáta*).

The varieties of the common white cabbage are very numerous: the sorts chiefly grown are the following:—

1. Early Dwarf. 2. Early Dwarf York. 3. East Ham. 4. Early Dwarf Sugar-loaf.	These are all early varieties, and will produce fine heads during the months of April, May, and June.
5. Large York, 6. Large Sugar-loaf. 7. Early Battersea. 8. Penton. 9, Imperial. 10. Antwerp. 11. Russian.	These are usually raised for general summer crops.
12. Large hollow Sugar-loaf. 13. oblong hollow. 14. Long-sided hollow. 15. Large round winter (white).	Succession summer and general autumn cabbages; excellent for full cabbaging in August, September, and October, and will last till Christmas.

Culture, &c.

SOIL.

The soil cannot well be too rich; a rather clayey than a sandy soil is to be preferred, and an open situation seems indispensable for the successful cultivation of the cabbage tribe.

PROPAGATED.

1. *By Seeds.* All the sorts are propagated from seed annually; and for a bed of the earliest kind, four feet wide by twenty long, two ounces of seed will be required; for the larger and later kinds, one ounce of seed will be sufficient for a bed of the same size. The soil most suitable for seed-beds is light, but not very rich loam, and the situation open and free. Each sort should be sown separately, and as regularly as possible, the seed raked evenly in, and if the weather is hot and dry, a little water must be given, and the ground covered with mats until the plants are come up, in order to keep the soil moist, as well as the birds from gathering up the seeds. The mats should be taken off as soon as the plants are fully up, otherwise they would be drawn up long-shanked and weak. Moderate watering should not be neglected.

2. The seed should be sown at three different seasons, the spring, summer, and autumn. For the first early crops, sow between the 6th and 12th of August, and neither sooner or later; for if sooner, many of the plants will run up to seed before they attain any size; and if later, they will not acquire sufficient strength to enable them to stand

over the winter so well as if advanced a little in growth. The first four varieties will be the best adapted for this sowing. To succeed the crops of the preceding autumn sowing, it is requisite to sow in the spring, to raise plants *for use the same year*, partly as young summer cabbages, and partly with full heads in autumn and winter. For this purpose sow at the close of February or in March, and in the beginning of April. A few for early summer use may be sown in the third week of February, on a slight hot-bed, or on a warm border under glass. In case no plants were raised the preceding autumn, or if the young crop that has stood the winter be much cut by severe weather, there is an additional motive for sowing a competent portion in the spring, of dwarf, middle-sized, and large kinds according to the above estimate of sorts. For successional summer, autumn, and winter crops, small portions must be sown at any time from May till July.

PLANT.

1. When the plants have three or four leaves, they must be transplanted either into nursery beds of good rich soil, four or five inches every way, and immediately watered to settle the soil to the roots, or into their final situation, which is decidedly the best, when an early crop is desired. Each sort must be planted separate in good rich mellow ground, well opened and exposed to the sun, in rows eighteen inches apart, and the same distance in the rows, let them be inserted with a dibble, setting the stems quite down to the leaves, and close the soil quite fast about each plant, a circumstance too frequently neglected; for if they are not fast, and the ground is subject to slugs or snails, as most land is more or less, such plants are sure to be attacked; and this generally in the stem just under the surface. They must be watered frequently until they have got good hold of the ground. Final planting may be deferred till spring, but not later, for if the plants have began to grow, and afterwards receive a check by removal, they are almost sure to run to seed before they attain near a cabbage state, and this has been found to be one great reason of there being so many *runners* (as they are called) as there frequently are. The latter and larger sorts should be treated exactly the same as above; only that they must be planted at a greater distance, from two to three feet, according to the size of the sort.

2. The plants should be frequently looked over, and if any have failed or are running to seed, they should be immediately pulled up, and the vacancies filled with fresh plants.

3. As soon as the plants are four or five inches high they must be well hoed, and the operation again repeated after a short interval, to clean the ground of weeds; the growth of the plants will be greatly promoted by digging once or twice between the rows, at the same time the plants should be well earthed up.

USE.

For the table, being one of our most common and useful culinary vegetables.

RED CABBAGE.

Red Cabbage (*Brássica oleràcea, var: rúbra.*)

This differs from the common cabbage in nothing but its colour, which is a purplish or brownish red; there are only three varieties:—

1. Large Red.
2. Dwarf Red.
3. Aberdeen red.

Culture, &c.

1. The cultivation and propagation of the red, is in every respect similar to that of the white cabbage.

2. The seed should be sown in August for a crop to stand the winter, to come in at the close of the next summer, then till the end of autumn. A second sowing may be made early in spring, for returns in the following winter and spring.

3. The plants should be permitted to grow till they have full and close firm heads.

USE.

Chiefly for pickling, for which purpose the dwarf red is preferred.

CAPSICUM.

Capsicum (*Cápsicum*), Pentándria Monogy'nia, Linn.; and Solánea, Juss.

For culinary purposes two varieties only are cultivated.

1. Long-podded (*Capsicum annuum*).
2. Cherry pepper (*Capsicum cerasiforme*).

Culture, &c.

PROPAGATED.

By seeds sown in a gentle hot-bed, in the month of March or beginning of April. They should be covered with rich mould, to the depth of a quarter of an inch, at the time of sowing.

PLANT.

1. Should be gradually inured to the air, and transplanted into a bed of fine rich earth, in a warm situation, in the beginning of June.

2. Planted at distances of eighteen inches apart, and occasionally watered to encourage their growth.

3. May be raised under a hand-glass, the seed being sown in a bed of light rich earth, in the month of May. The plants should have air during the day, but they must be well protected from frosts during the night, and at the end of June, when all danger from frost is at an end, transplanted into proper beds as above.

USE.

1. *The berries in a green state* for pickling, for which purpose the cherry capsicum is usually employed.

2. *The berries in a dry state*, as a spice of the hottest quality, called *Cayenne pepper*. As a *spice*, the long-podded variety is preferred.

CARAWAY.

Caraway (*Cárum cárui*), Pentándria Digy'nia, Linn.; and Umbellíferæ, Juss.

A hardy biennial, and useful aromatic plant.

Culture, &c.

SOIL.

Prefers a light rich soil.

PROPAGATED.

By seeds.

1. Sown in autumn, soon after the seeds are ripe, and when the plants are fairly up, they must be thinned either to six or twelve inches apart. The plants that rise in the autumn generally flower the following season, so that a summer's growth is thereby saved.

2. Sown in March or April, either broadcast or in shallow drills, six inches apart; they must then be thinned as above. For a seed-bed four feet by five, a quarter of an ounce of seed will be sufficient. The plants raised in spring will not flower till the following year.

USE.

1. The seeds are used both in confectionary and medicine, and also for distillation with spirituous liquors.

2. The roots, which are fusiform, are sometimes eaten, and by many preferred even to parsneps.

CARROT.

Carrot (*Daúcus caróta*), Pentándria Digy'nia, Linn.; and Umbelliferæ, Juss.

The carrot is a biennial plant, a native of this country, growing plentifully by road sides; and from the appearance of its umbels, which are concave, has obtained the name of "Bird's Nest." Its root, which is small, is of a white colour, and is dry, sticky, and strong-flavoured; by cultivation, however, it attains a large size, assumes a reddish yellow colour, becoming succulent, and of a mild flavour. In its cultivated state many varieties have been obtained; and, as in the case of the bean, it will, for the sake of reference, be necessary to divide these into two classes; the one adapted for *Field*, the other for *Garden* culture.

Culture, &c. of the Field Carrot.

The Long-red, or large red Field Carrot, is the only variety employed for agricultural purposes.

SOIL.

To obtain large crops there must be a considerable depth of fine rich mould; either of the friable, loamy, or sandy kinds. The carrot will not succeed on stiff, clayey, or gravelly soils. The black deep vegetable, and the rich deep sandy soils, appear the best calculated for this kind of crop; and the medium sands, and sandy loams, stand next, as best adapted to its culture.

PROPAGATED.

1. *By Seeds*, sown either broad-cast or in drills; but as the seeds of the carrot are not of a nature to be deposited with much regularity by the drill, the broad-cast method is almost universally practised.

2. *The season for sowing* the carrot is generally about the middle or latter end of March, but it should on no account be protracted later than the beginning of April.

3. *The quantity of seed* per acre varies considerably among different cultivators, but from four to six bushels when sown broad-cast, may in general be the most suitable quantity. Burrows, a successful cultivator, sows ten pounds per acre, in the broad-cast manner. But where the drilling system is adopted, two pounds per acre are said to be fully sufficient.

4. *The preparation of the seed.*—On account of the lightness of this kind of seed, it has been found necessary to mix it, or blend it, with other substances, as earth, sand, ashes, &c., in order that the seeds may be separated more freely, and sown or dispersed over the ground with more regularity. Burrows adds water to the sand or earth, bringing his seed to the point of vegetating before he sows it; for every acre of land, he mixes two bushels of sand, or fine mould, with ten pounds of seed; this operation is performed about a fortnight or three weeks before the time of sowing; the heaps are carefully turned over every day, sprinkling the outside of them with water each time of turning over, that every part of the sand heaps may be equally moist, and that vegetation may take place alike throughout. "I have great advantage," says Mr. Burrows, "in preparing the seed so long beforehand; it is by this means in a state of forward vegetation, therefore lies but a short time in the ground, or by quickly appearing above ground, is more able to contend with those numerous tribes of weeds in the soil, whose seeds are of quicker vegetation.

5. *In the preparation of the soil*, repeated deep ploughing is necessary, in order that the roots may be enabled to press downwards, and distend themselves with facility in the soil; for if pulverization is not effected to a considerable depth, the roots are liable to become forked and of very limited growth, sending off numerous lateral roots, in consequence of their inability to get down; by which the quantity and value of the produce are greatly lessened. This deep tillage may be perfectly accomplished, either by means of the trench-plough following the common one, or by the common one alone with a good strong team; but the former method is to be preferred wherever the lands are stiff or heavy. Three ploughings are mostly found sufficient, where the land has been previously in a state of tillage; but more may in any other case be necessary. The first ploughing should be made to the depth of ten, twelve, or fourteen inches, and be performed when the soil is tolerably dry, about the beginning of October. It may remain in this state till towards the middle of February, when it should be turned over a second time to nearly the same depth. In March a third ploughing may be given in order to the putting in of the seed. This must be considerably lighter than either of the preceding ones, or it would bring the lower mould to the surface; at this ploughing a suitable proportion of well-rotted manure should be turned into the soil; a practice, however, which is condemned by some, as it is alleged that the roots where they come in contact with the dung become forked, scabbed, and wormy; but the Norfolk and Suffolk farmers, who are the most successful cultivators of the carrot, alway adopt the plan of turning in the manure at the last ploughing. Burrows prepares the land with a good dressing of rotten farm-yard manure, or cottager's ashes, at the rate of sixteen cart-loads per acre, setting it on at the time of sowing. The best of all preparations for this root is a turnip fallow, the crop of which has been fed on the land by sheep; the next best, a barley that has succeeded turnips so fed.

6. *Manner of sowing*.—The most common practice is the band, or broad-cast mode, the seed being dispersed as evenly as possible over the land, after the surface has been reduced to a very fine state of pulverization by harrowing, in order to provide a suitable bed for it to vegetate in, being thus covered by means of a light harrow.

7. *After culture*.—This consists entirely of hoeing and weeding. In Suffolk they are hoed generally three times in a season. The first time, as soon as the plants can be distinguished from the weeds which surround them, which should be done with three-inch hoes, having handles not above two feet in length. It is an operation that requires to be performed with great attention, as it is extremely difficult to distinguish and to separate the young carrots from the weeds. The second hoeing should be given in three or four weeks afterwards, according to the forwardness of the crop; it may be performed with common hoes, care being taken to set out the plants at proper distances. From eight to fifteen or eighteen inches each way, is the common distance at which they are allowed to stand; and it has been proved from many years experience, in districts where they are most cultivated, that carrots which grow at such distances always prove a more abundant crop than when the plants are allowed to stand closer together. The third hoeing is commonly made about the middle or end of June; and in this, besides destroying the weeds, another material circumstance to be

attended to, is to set out the carrots at proper distances, and also wherever any have been left double at the former hoeings, to take the worst of the two plants away. According to Burrow's method, they are ready to hoe within about five or six weeks. He hoes three, and sometimes four times, or until the crop is perfectly clean; the first hoeing is with hoes four inches long and two and a quarter inches wide. The second hoeing invariably takes place as soon as the first is completed, and is performed with six-inch hoes, by two inches and a quarter wide. By this time the plants are set; the first time of hoeing nothing was cut but the weeds. He leaves the plants nine inches apart from each other; sometimes they will be a foot or even farther asunder.—*(Loudon's Agric.)*

8. *Taking of the crop.*—The crop is generally taken in the last week of October; two methods have been practised, the one by means of the plough, the other by the fork. The former is the most expeditious, but the roots are apt to be much broken, whilst by loosening the mould with three-pronged forks of sufficient length, and at the same time drawing up the plants by the tops, they may be raised with great facility, and without sustaining injury. Burrows' practice is to let the work to a man, who engages women and children to assist him, the work is performed with three-pronged forks; the children cut off the tops, laying them and the roots in separate heaps, ready for the teams to take away. "I take up in autumn, a sufficient quantity to have a store to last me out any considerable frost or snow that may happen in the winter months; the rest of the crops I leave in the ground; preferring them fresh out of the earth for both horses and bullocks. The carrots keep best in the ground, nor can the severest frosts do them any material injury; the first week in March it is necessary to have the remaining part of the crop taken up, and the land cleared for barley; the carrots can either be laid in a heap with a small quantity of straw covered over them, or they may be put into some empty outhouse or barn, in heaps of many hundred bushels, provided they are put together dry. This latter circumstance, it is indispensably necessary to attend to, for if laid together in large heaps when wet, they will certainly sustain much injury. Such as I want to keep for the use of my horses until the months of May and June, in drawing over the heaps (which is necessary to be done the latter end of April), when the carrots begin to sprout at the crown very fast, I throw aside the healthy and most perfect roots, and have their crowns cut completely off and laid by themselves; by this means, carrots may be kept the month of June out, in a high state of perfection."—*(Communications to the Board of Agric.)*

9. *Sowing the seed.*—Select annually some of the most perfect and best-shaped roots, in the taking up season, and either preserve them in sand in a cellar till spring, or plant them immediately in an open airy part of the garden, protecting them with litter during severe frosts, or earthing them over, and uncovering them in March following. The seed is in no danger of being contaminated by any other plant; as the wild carrot, even should it happen to grow in the neighbourhood, flowers later. In August it will be fit to gather, and is best preserved till wanted on the stalks. This is the most certain mode of procuring genuine and new seed, but still it will be found adviseable to change it occasionally.

Use.

1. The uses to which the carrot is applied in Suffolk are various. Large quantities are sent to the London markets, and also given as food to different kinds of live stock. Horses are remarkably fond of carrots, and it is even said, that where oats and carrots are given to horses together, the horses leave the oats and eat the carrots. The ordinary allowance is about forty or fifty pounds a day to each horse. Carrots, when mixed with chaff, that is, cut straw and a little hay, without corn, will keep horses in excellent condition, for performing all kinds of labour. The farmers begin to feed their horses with carrots in December, and continue to give them chiefly that kind of provender till the beginning or middle of May; to which period, with proper care, carrots may be preserved. As many of the farmers in that country are of opinion that carrots are not so good for horses in winter as in spring, they give only half the above allowance of carrots at first, and add a little corn for a few weeks after they begin to use carrots.

2. Burrows, in his communications to the Board of Agriculture, has ably shown the application of this root to the feeding of cattle and swine. " I begin," says he, " to take up the carrot-crop in the last week of October, as at that time I generally finish soiling my horses with lucern, and now solely depend upon my carrots, with a proper allowance of hay, as winter food for my horses, until about the first week of June following, when the lucern is again ready for soiling. By reducing this practice to a system, I have been enabled to feed ten cart-horses throughout the winter months for these last six years, without giving them any corn whatever, and have, at the same time, effected a considerable saving of hay, from what I found necessary to give to the same number of horses when, according to the usual custom of the country, I feed my horses with corn and hay. I give them to my cart-horses in the proportion of seventy pound weight of carrots a horse per day, upon an average, not allowing them quite so many in the very short days, and sometimes more than that quantity in the spring months, or to the amount of what I withheld in the short winter days. The men who tend the horses slice some of the carrots in the cut chaff or hay, and barn-door refuse, the rest of the carrots they give whole to the horses at night, with a small quantity of hay in their racks; and with this food my horses generally enjoy uninterrupted health. I mention this as I believe that some persons think that carrots *only*, given as food to horses, are injurious to their constitutions; but most of the prejudices of mankind have no better foundation, and are taken up at random, or inherited from their grandfathers. So successful have I been with carrots as a winter food for horses, that, with the assistance of lucern for soiling in summer, I have been enabled to prove, by experiments conducted under my own personal inspection, that an able Norfolk team-horse, fully worked two journies a day, winter and summer, may be kept the entire year round upon the produce of only one statute acre of land. I have likewise applied carrots with great profit to the feeding of hogs in winter, and by that means have made my straw into a most excellent manure, without the aid of neat cattle: the hogs so fed are sold on Norwich hill to the London dealers as porkers."

3. When given to milch cows, the quantity of both milk and butter is said to be greatly increased, without the flavour being in any ways impaired.

Garden Carrot.

Garden Carrot (*Daúcus caróta*), Pentándria Digy'nia, Linn.; and Umbellíferæ, Juss.

The following varieties are described by Mr. Christie (*Hort. Trans.* vol. iv.)

1. Early Red. 2. Common Early. 3. The Long.	Horn Carrots.
1. The White. 2. The Yellow, 3. The Long Yellow. 4. The Long Orange. 5. The Long Red. 6. The Purple.	Long Carrots.

The *Long Red* is the most useful of the long carrots, and is the kind most proper to be cultivated for winter use.

The *Purple* is seldom cultivated, except for its singular appearance.

7. The Alteringham carrot, one of our best carrots, and although a novelty in the south of England, has been cultivated for some years in the north, being originally from Cheshire.

Soil.

The carrot prefers a light rich sandy soil, which should be dug eighteen inches deep. It

should be made as fine as possible, add free from roots and stones, as these interrupt the perpendicular descent of the root, and force it to branch, or to take a spiral growth. Fresh dung on no account should be added, but the ground ought to be well manured and prepared some time previous to the period of sowing.

PROPAGATED.

1. *By Seeds*, sown either broadcast or in drills: the latter practice is a most general one. If broadcast, for a bed four and a half feet by thirty, one ounce of seed will be required. The same quantity will be sufficient for a drill 150 feet in length. Disappointment is often experienced on account of the badness of the seed; it will therefore be advisable to prove the seed by sowing a small quantity in a pot, which may then be plunged into a hot-bed, or placed in a hot-house.

2. The seeds have long forked hairs, by which they adhere close together, and in order to sow them regularly they must be mixed with sand and well rubbed, to separate them previous to sowing. The seed should be sown in calm weather, as it is very light, and liable to be dispersed by the wind; it should be sown pretty thickly and equally over the surface of the ground, when it must be immediately and evenly raked in; but if the ground is very light and dry, it may then be trod down previously to this operation.

3. *Periods for sowing.*—For an early crop, sow the early horn, or the Alteringham carrot, about the middle or end of February, on a light border or other sheltered situation, covering them with haulm or fern leaves in the event of severe frosts or cutting winds. The orange may be sown the first week in March, and for a *full crop* the middle of April may be chosen, should the weather prove open and dry. The Long-red and Alteringham carrots are the best adapted for the main crops. Successional sowings for drawing as young carrots, throughout the year, may be made from May to August.

4. *Subsequent culture.*—When the plants are come up two or three inches, they must be thinned and cleared from weeds, setting the plants five or six inches asunder, for the early crop to draw off while young; but for latter or main crops, intended for full size, the plants must be left eight or nine inches apart. The whole must be kept perfectly clear from weeds, at all times.

5. *Taking and preserving the crop.*—Towards the latter end of October the crop may be taken up and stored for winter use; after they are taken up the tops must be cut off, but not too close; they must be neatly stacked up, laying them heads and tails alternately, and the whole well packed with sand as the operation goes on.

6. *To save seed.*—Plant some of the largest and best roots early in spring, at eighteen inches or two feet apart, every way, inserting the crown about two inches below the surface; they will soon be up, and produce ripe seed in autumn, when they should be gathered, taking only three or four of the main umbels, as from the seed of these the most vigourous plants are produced. In selecting the best roots be careful to examine the crowns of your plants, and choose those only that have *single buds or taps;* for if the plant chosen contains more than one bud or offset, the seeds will certainly have a greater tendency to produce leaves than roots.

USE.

The carrot is used chiefly for culinary purposes, for soups and stews, and also forms a vegetable diet.

CATTLE.—*See* NEAT CATTLE.

CAULIFLOWER.

Cauliflower (*Brássica olerácea, var. Botry'tis*), Tetradynámia Siliquósa, Linn.; Crucíferæ, Juss.

The Cauliflower is an annual plant, and the most delicate and most esteemed of all the Brassica tribe. " Of all the flowers in the garden," Dr. Johnson used to say, " I like the cauliflower." The principal sorts cultivated are—

1. The Early,—for the first early crops.
2. The Later or Large,—for principal early and main crops.
3. The Red or Red-stalked,—a more hardy variety than either of the preceding, and well calculated for an early crop.

Culture, &c.
SOIL.

To produce fine cauliflowers, the soil for the *plants* should be made as rich as possible.

PROPAGATED.

1. *By Seeds*, which should be sown on a light but not very rich soil, and for a bed four and a half feet wide by ten feet in length, half an ounce of seed will be required.

2. For obtaining cauliflowers during three seasons of the year, successional crops must be sown. The *first* or main crop, destined to stand the winter and to furnish early supply, is generally sown about the last week of August, and as great expence and trouble have been bestowed to secure this tender plant, it is desirable to find some mode of giving it a degree of hardihood capable of resisting the frosts of our ordinary winters. Ball finds that if cauliflower seed is not sown till the last week in August, and that if the seedlings are not transplanted till the middle or near the end of November, before the hard weather sets in, no sort of covering is necessary, nor any other protection than that afforded by a wall having a south aspect. In such a border, and without any covering, young cauliflower plants have uniformly stood well for many successive winters, and have always proved better and sounder plants for spring planting than such as have had additional shelter. Cauliflower plants, it is probable, are often killed with too much attention. Seedlings raised in autumn seem to be very tenacious of life. It certainly seems very desirable to avoid the trouble and heavy cost of bell-glasses; a mode of culture scarcely feasible by the domestic gardener, who may well shrink from that which, with loss of time and breakage, must be supposed to enhance the price of each head at least a shilling; for in the month of November, four, five, or six plants are placed under hand or bell glasses, which are constantly to be removed in fine weather and at other times, according to the vicissitudes of the season, to be raised on the south side, or to be supported on bricks, to permit of the needful access of air during the day. These glasses must be closed down during the night, and also in rigorous weather, when an additional covering, or extra protection of mats or litter will be required. Finally, at the approach of spring, the weaker plants are removed, more air is given, and at length the plants having grown so as to fill the glasses, are wholly exposed, and being earthed up are left to mature their heads. One plant only, the finest, should remain, and the earth should be formed into a kind of dish round each

stem, to contain water or rather liquid manure, as the cauliflower is what is called "a foul feeder."

The *second*, or spring sowing, may be made early in March, under a border of as light rich earth as possible, and when the young plants are big enough to plant out, that is, when they have got leaves an inch broad, prick them out into other beds of the same description, and at the distance of three inches every way; here they must stand until the end of April or beginning of May, at which time they are strong enough to remove into their final situation in the open garden. If the weather should prove unfavourable at the time of sowing, as may be expected at this early season, a moderate hot-bed should be prepared, and after setting on the frames, the bed should be covered three or four inches thick with as light rich soil as possible, and the seed sown pretty thick, and when the plants are come up large enough to transplant, prick them out under another frame, but without heat, to gain strength for the open air. The cauliflowers raised from this sowing will be in perfection in the end of July and beginning of August.

For a *third* and last crop, sow some of the same sort of seed as for the last crop, in the last week in May, also on a bed of light rich earth, and in a warm situation, and when they are big enough prick them out as before. This is commonly called the Michaelmas crop, and will begin to produce their heads in the latter end of October, and will hold out or continue till Christmas, if open mild weather follows.

3. The ground for early crops should be open and well exposed to the sun, but all crops planted after the first week in May should be planted in a shady border.

4. *Subsequent culture.*—After each of the respective crops are finally planted out, the ground about the plants must be kept hoed in order to cut down the weeds, and at the same time to draw some soil to the stems of the plants. When the soil has been drawn up to the plants some little time, fork the ground between the rows lightly over, which will be of considerable advantage to their growth. All crops must be liberally supplied with water in dry weather: those out of flower twice a week, and those in every other day, which will contribute to their producing very large heads. As the flower-heads appear, the larger leaves should be broken down over them to defend them from the sun and rain, as well as to preserve them in white and close perfection.

5. *To preserve Cauliflowers through the winter.*—There are various methods of preserving cauliflowers through winter, but the one most approved is, to take the plants up a day or two before they are fully grown, and when they are perfectly dry, taking off all the large under leaves, placing them in rows in a dry shed, and covering the roots of each row with dry earth, laying them sideways, with the crown or head of the second row close to the under leaves of the first, and so on till the whole is complete; thus they may be kept in a good state from the beginning of November till the end of January. It may be necessary to cover the whole with a mat in very rigorous frosts; but not generally so, and care must also be taken to clear away all decayed leaves as they appear.

6. *To save seed.*—Some of the prime plants of the early and main crop should be marked out when the heads are in full perfection, as those of the late sowing will not ripen seed effectually. The seed

will ripen in September, when it must be tended, otherwise the birds will destroy a great part of it, and the branches must be gathered as the seed ripens, and laid, elevated from the ground in an airy situation, to dry and harden to full perfection, after which it must be rubbed out and cleaned from the husky parts, and spread on a cloth to dry equally, when it may be wrapped up and put by for use the following spring and summer.

USE.

1. For the table, the flower-bud forms a firm close head of a white colour, and being wrapped up in a clean linen cloth and boiled, is served up at table as a very delicate dish.

CELERY.

Celery (*A'pium gravéolens*), Pentándria Digy'nia, Linn.; and Umbelli'feræ, Juss.

The celery is a hardy biennial indigenous plant, and in its wild state is known by the name of smallage. It grows naturally in ditches, and generally near the sea; its taste is very rank, and its whole habit very coarse; but by cultivation it has become remarkably sweet and grateful, and is a favourite with almost all classes of society. The following varieties are in cultivation:—

1. Upright Italian.
2. Large Hollow Upright.
3. Solid Upright.
4. Large Red-stalked Upright.
5. Turnip-rooted or *Celeriac*. This variety is cultivated for its root; is hardier than the other kinds, and will continue longer in spring.

The first three varieties are preferable for general crops; the fourth is fit for stewing, and is hardy enough to stand a severe winter.

Culture, &c.

SOIL.

Prefers a rather moist soil, rich in vegetable manure, but not rank from new unrotted dung.

PROPAGATED.

1. *By Seeds.*—All the varieties are raised from seed, and for a bed four feet and a half wide and ten long, half an ounce of seed will be quite sufficient.

2. For the main summer, autumn, and winter crops, let the principal sowing be made from the middle of March to the first week of April, in beds of light rich mellow earth, raking in the seed lightly and regularly. In very dry weather moderate waterings should be given, both before and after the plants come up. Judd, a very successful cultivator of celery, sows about the middle of January, in a warm situation, on very rich ground, protecting it by mats at night. When the plants are from two to three inches high, he pricks out into a nursery bed, immersing the plants as he draws them in water, so that they may remain moist while out of ground. The plants remain in the nursery beds till they become very strong.—(*Hort. Trans.* vol. 2.)

PLANT.

1. When the plants are from two to three or four inches high, they may be pricked out into nursery beds, which should always be made rich by previous manuring; the plants must be liberally supplied with water, and when they have attained the height of from six to twelve inches, may be removed into trenches previously prepared for their reception.

2. *Transplanting into trenches.*—For this purpose, a month previous to planting, allot an open compartment, and form it into trenches eighteen inches wide and six inches deep,

at five feet distance from each other, measuring from the centre of each trench. Fill the trenches with good well-rotted manure, and that from an old hot-bed is the best. Dig the dung into the trenches, working the soil and it well together. This digging repeat two or three times, in order to incorporate the dung and soil the better. At the time of planting apply a little more dung of the same sort and dig it in, and give it a good watering; but do not plant till the evening. In performing the operation of planting, first take up the plants from the nursery or seed-bed and train them, stripping off all straggling leaves and side shoots close to the root, but never cut the tops, the leaves being very essential to the growth and well-doing of the plants. Trim the roots, cut off the tap-root, which will cause them to throw out a brush of fibres, and thus preventing them striking deep into the ground, the plant will never run to seed before the following spring. As soon as the plants are thus dressed, immerse the roots in water while out of ground. Plant a single row at the bottom of each trench, setting the plants five or six inches apart, and give them a good watering immediately, and repeat it in dry weather until the plants show a renewed growth, and occasionally continued until the plants are ready to be earthed up, but not afterwards. Continue planting out a monthly succession from June to September, and thus provide for a supply from July to the following spring.

Judd prepares his ground for transplanting by trenching it two spades deep, mixing with it in the operation a good dressing of well-reduced dung from the old forcing beds. He says, "I give it a second trenching, that the dung may be better incorporated with the mould, and then leave it in as rough a state as possible, till my plants are ready to be put out. In the ground thus prepared, I form trenches, twenty inches wide and six inches deep, at six feet distance from each other, measuring from the centre of each trench. Before planting I reduce the depth of the trenches to three inches, by digging in sufficient dung to fill them so much up. At the time of planting, if the weather be dry the trenches are well watered in the morning, and the plants are put in six inches apart in the row, in the evening, care being taken by the mode above mentioned, to keep the fibres quite wet whilst out of ground; as they are drawn from the nursery beds, the plants are dressed for planting, and then laid regularly in the garden pan. The trenches in which my rows of celery are planted, being so very shallow, the roots of the plants grow nearly on a level with the surface of the ground, this I consider particularly advantageous; for as considerable cavities are necessarily formed on each side when the moulding takes place, all injury from stagnant water, or excess of moisture, is prevented. The trenches, when planted, are watered as may be required. He adds that he prepares his ground for celery during the winter, and avoids putting much of a crop in the space between the trenches, especially one that grows tall, as he finds celery does best when it grows as open as possible.

3. *Subsequent Culture.*—As the plants advance from eight or ten, to twenty inches or two feet, earth them up (commonly called landing up), but the two first mouldings must be done very sparingly, being careful not to load the plants with earth too much at first, only drawing a little mould on a ridge on each side the row, leaving the plants as it were in a drill, and thus they will receive the full benefit of the rain and waterings; and when the plants are strong enough to bear six inches of mould, land them up to that height, being careful that no earth falls into the heart of the plant, to prevent which provide long strands of bass matting, tied together, till of sufficient strength for one entire row. Fasten one end of this bass to a small stake, put down at the end of the row for the purpose; and then beginning with the first plant, give it one twist round the top of the leaves, and then pass it to the next, and so on to the end of the row, where it must again be fastened. When the moulding is finished the string is easily unravelled, by beginning to untwist it at the end where it was last fastened. The autumn and winter crop having attained their full growth, give them a final landing up near the tops, which will increase the length of the blanched parts, and be a means of protecting them more effectually from severe frost during winter. Always choose a dry day for this work, and also when the plants are perfectly dry, for if water should be lodged in the bottoms of the leaves it cannot easily escape after being landed up, consequently the plant would be in imminent danger of becoming rotten, and the crop lost.

4. *Taking the crop.*—In taking the crop dig close down to the roots, then inserting the spade under the roots, loosen them, and taking hold of the tops with the other hand, raise them up without breaking the stalks.

5. *Gathering and preserving for winter use.*—On the approach of winter, in order to provide against the frost, take up a part of the crop, and without cutting off the tops lay them in a dry place, as in the back shed of the hot-house, and cover the roots with dry sand or earth, leaving the tops out. In order to preserve those left in the ground, lay some long dry litter over the tops, but remove it when the weather is mild and fine.

6. *Saving seed.*—In order to save seed, either leave some of the established plants where growing, thinning them out to two feet distant in the rows, or in the spring take up a sufficient number of plants, cut off the tops, and plant them in the ground at the above distance.

Use.

The leaf stalks when blanched are used raw as a salad from August till March. They are also stewed and put into soups.

Culture, &c. of Celeriac.

The seed may be sown at the same time as for celery, and the plants treated in the same way, for the open ground, until the time of final transplanting; but for an early crop sow on a moderate hot-bed in the beginning of April, and when the plants are strong enough, they should be planted out on a another hot-bed, setting them an inch and a half apart, and giving them plenty of water as soon as planted. Abundance of air should be given every day until the beginning of June, then transplant them into their final situation on a bed of light rich earth, and at the distance of fifteen inches every way, and not in the trenches as for celery. Plenty of water should be given as soon as planted out, and should be repeated once every other day: and if the weather be dry, every day will not be too often. They should be occasionally hoed to clear them from weeds.

USE.

The root of this variety is the only part used, and is excellent in soups, in which slices of it are used as ingredients, and easily impart their flavour. It is also used as a salad, the roots and rind being cut or pared off. They are put into cold water, and boiled till a fork will readily pass through them, after which they must be taken off, and when cold they may be eaten with oil and vinegar.

CHAMOMILE.

Chamomile (*An'themis nóbilis*), Syngenésia Polygámia supérflua, Linn.; and Compósitæ, Juss.

A hardy indigenous perennial, cultivated for its aromatic flowers, which have a bitter flavour, and are chiefly employed for medicinal purposes: there are only two varieties.

1. The Common Single Flowered.
2. The Double Flowered.

Culture, &c.

SOIL.

This plant will thrive best in a poor light sandy soil.

PROPAGATED.

By parting the roots, or by slips of the rooted offsets, or of the runners. The roots must be detached, in little tufty sets, in March, April, or May, planting from eight to twelve inches asunder, and watering them occasionally, if required. They will produce flowers towards the end of June, and continue in blossom during the greater part of the autumn; and will continue productive for many years.

PLANT.

The flowers should be gathered when full blown, and spread to dry in a shady situation and when perfectly dry they must be put into paper bags and preserved for use.

USE.

1. The dried flowers, which have a bitter aromatic and slightly pungent taste, and a strong unpleasant odour. As the taste and odour reside in the tubular florets, which are *larger in the single flowers,* these are preferable to the *double,* that are always sold in the shops.

2. The chamomile is a powerful tonic and stomachic, and inferior to no other when properly administered. It is an excellent and popular remedy for a weakened state of the stomach, attended by the ordinary symptoms of indigestion; as heartburn, loss of appetite, flatulency, &c. In such affections, particularly if accompanied by a sluggish state of the intestinal canal, the cold infusion made with half an ounce of the flowers to a pint of water, and combined with aromatics and alkalies, is grateful to the stomach; or, should hot water be employed, it must be allowed to stand on the flowers ten minutes only. The dose is from one to two ounces, two or three times a day.

CHEMISTRY.

Outlines of Agricultural and Horticultural Chemistry.

By G. W. Johnson, Esq.* F.L.S. Z.S. & H.S.

It is certain that a cultivator of the soil should have a knowledge of botany, systematic and physiological; otherwise he will be unable to understand terms and observations that must occur in every well-written work on his art, unable to comprehend the nature and habits of the objects of his culture, or to render observations he may make intelligible to others, or even to himself. Chemistry is of as much, if not greater, importance to him, and to this science, as illustrative of the agricultural arts, I shall chiefly confine my attention. Without a knowledge of it, many of the simplest operations must be unintelligible to the cultivator, and consequently be casually performed, knowing nothing of them but what he has learned by rote, or stumbled upon by chance.

The nature of soils, of manures, of the food and functions of plants, would all be unknown but from the analyses which chemists have made. We know that every plant has a particular temperature in which it thrives best; a particular modification of food; a particular degree of moisture; a particular intensity of light: and those particularities vary at different periods of their growth. It is certain that plants are subject, like all other organized bodies, to various influences. Acids are injurious to some, alkalies to others: the excess of some of their constituents, and the deficiency of others, insure disease to the plants to which such irregularities occur. Disease is accompanied by decay more or less extensive and rapid; and if these cannot be checked by salutary applications and treatment, death ultimately ensues. Now, if it was possible for any science or sciences to teach the cultivator of plants how to provide for them all the favourable contingencies, all the appropriate necessaries above alluded to, and to protect them from all those which are noxious to them, the art of cultivation would be far advanced to perfection. Such sciences are Botany and Chemistry.† It is not asserted that they can, at present, do all that is desired of them,—all of which they are capable; but they can do much. As evidence of what can be effected by a combination of chemical and practical knowledge in the cultivation of the soil, we may quote the example of Lavoisier. 'He cultivated 240 acres in La Vendée, actuated by the beneficent desire of demonstrating to his countrymen the importance of sustaining the art of cultivation on scientific principles. In nine years his produce was doubled, and his crops afforded one-third more than those of ordinary cultivators. It is unnecessary to dwell upon the importance of this improvement. Science can never supersede the use of the dunghill, the plough, the spade, and the hoe; but it can be one of their best guides,—can be a pilot even to the most experienced.

It will be well to commence this sketch of Chemistry applied to the cultivation of the soil, by considering *the Root* of plants, its offices, the mediums in which it grows, the nourishment it obtains for its parent plant, &c.; consequently it includes the consideration of soils, manures, &c.

* This valuable contribution has in part appeared in some of the recent numbers of the Gardener's Magazine; but has subsequently undergone considerable alteration and revision by the author expressly for this work.

† Johnson's History of English Gardening, 1829, p. 365.

The Root.

The root is present in all cultivated plants. The Truffle, which, however, can scarcely be considered as belonging to cultivated vegetables, having hitherto defied all attempts to subjugate it, may be considered as consisting of nothing but root. A root is annual, biennial, or perennial. In the two former instances, if the individuals to which they belong be allowed to perfect their seed, no care can protract their existence beyond the ensuing winter, however genial the temperature, &c. in which they are made to vegetate; but if the ripening of seed be prevented, it is undetermined how long they may, in most instances, be sustained in life. I have known mignonette continued in healthy vegetation for four years with this precaution. In all roots, and under any mode of management, the fibrous parts (radiculæ) are strictly annual; they decay as winter approaches, and are produced with the returning vigour of their parent in the spring. Hence the reason that plants are transplanted with the most success during the season of their decay; for as the root almost exclusively imbibes nourishment by the mouths of these fibres, in proportion as they are injured by the removal, so is the plant deprived of the means of support; that sap which is employed in the formation of new fibres would have served to increase the size of other parts. The size of the root I have always observed to increase with the poverty of the soil in which it is growing. Duhamel found the roots of some young oaks in a poor soil to be nearly four feet long, though the stem was not more than six inches. The cause of this is evident; the nourishment which is required for the growth of the plant, can only be obtained by an increased wide-extending surface of root, and to form this, more sap is often required than the plant, owing to the poverty of the earth, can obtain to itself; in that case a soil is sterile, for the plant must evidently perish. Every one may have noticed this familiarly instanced in Pòa ánnua, the grass so commonly growing on gravel walks; its stem minute, its roots a mass of widely-contending fibres. A root always proceeds in that direction where food is most abundant; from a knowledge of this fact, we should be circumspect in our mode of applying manures according to the crop, and object we have in view. The soil in my own garden being shallow, never produced a carrot or parsnip of any size, but almost every root consisted of numerous forks thickly coated with fibres; digging two spades deep produced no material advantage, the gardener applying, as usual, manure to the surface; but by trenching as before, and turning in a small quantity of manure at *the bottom*, the roots always spindle well, grow clean, and have few lateral fibres. This observation applies equally to Mangold Wurzel. For late crops of peas, which mildew chiefly from a deficiency of moisture to the root, it is an object to keep their radiculæ near the surface, for the sake of the light depositions of moisture incident to their season of growth; hence it will always be found of benefit to cover the earth over the rows with a little well-rotted dung, and to point it lightly in. Plants are very much benefited by having oxygen applied to their roots, being found to consume more than their own volume of that gas in twenty-four hours; and when applied by Mr. Hill to the roots of melons, hyacinths, &c. the first were found to be improved in flavour, the second in beauty, and all in vigour, (*Hort. Trans.* vol i. p. 233). Every thing, therefore, that promotes the presentation of oxygen to the roots of plants must be beneficial; hence we find that frequently stirring the ground about them promotes their growth, for in proportion as the soil is loose, can the atmosphere easily penetrate it; moist earth rapidly absorbs oxygen from the atmosphere, as Humboldt has demonstrated, but dry soil does not. This affords another reason for frequently stirring the earth about plants during the droughts in summer, for well-pulverized soils admit the evening dews, &c. more freely than consolidated ones, and consequently dews will be deposited more within their texture, and moisture is more firmly retained in such puverized soils, in-as-much as they are not so much heated by the sun's rays, being more pervaded by the air, which, like all gases, is one of the worst conductors of heat. The decomposing parts of animals and vegetables contained in a soil, are also highly absorbent of moisture; hence the more freely the air is exposed to them, the more effectually will they be enabled to exert this power. By being freely exposed to the influence of the air, such substances are more rapidly decomposed, which leads to a consideration of the practice of exposing soils, as much as possible, to the action of the atmosphere, by ridging, &c. When a soil is tenacious, or abounding in stubborn vegetable matters, as in heathy lands, it cannot be too completely exposed to the action of the air; but as to light soils, which are in general deficient in organic decomposing matters, chemistry would say that redging is accompanied with evils more injurious than can be compensated by the benefits obtained; for such light soils are easily pulverized whenever occasion requires, and are so porous as at all times freely to admit the pervasion of the atmosphere; and therefore by this extra exposure, the vegetable and animal remains are hastened in decomposing, and much of their fertile constituents evolved in the state of gas, or carried away by the rains, &c. without there being any crop upon them to benefit by them. Thus theory argues, and practice certainly seems to support, in this instance, her doctrine. Switzer, one of our horticultural classics, says " rich heavy ground cannot well be ploughed too often to make it light, and the better manure by killing the weeds; as light poor ground cannot be ploughed too seldom, for fear of impoverishing it.—(*Technographia Rustica*, vol. iii. p. 237.)

We have seen that plants search after and acquire food by the agency of their roots; and the extremities of these appear to be the chief if not the only parts employed in the intro-

susception of all food not in a gaseous state, for M. Duhamel observed that that portion of a soil was soonest exhausted, in which the greatest number of the extremities of the root were assembled.—(*Physique des Arbres*, vol. iii. p. 276). This explains why the fibrous points of roots are annually renewed, and the caudex extended in length; by these means they each year shoot forth into a fresh soil, always changing their direction to where most food is to be obtained. If the extremity of a root is cut off it ceases to increase in length, but enlarges its circle of extension by lateral shoots. It is by their extremities, then, that roots imbibe food; but the orifices of these are so minute that they can only admit such as is in a state of solution. Carbon, reduced to an impalpable powder, being insoluble in water, though offered to the roots of several plants, mingled with that fluid, has never been observed to be absorbed by them, yet it is one of their chief constituents, and is readily absorbed in any combination which renders it fluid.

Roots, then, obtain such nourishment to plants from a soil, as is in a gaseous or liquid state; we may next, therefore, consider what constituents of soils are capable of being presented in such forms. Water can be the only solvent employed; indeed, so essential is this liquid itself, that no plant can exist where it is entirely absent, and, on the other hand, many will exist with their roots in vessels containing nothing but distilled water. Plants with a broad surface of leaves, as mint, beans, &c., I have always found increase in carbonaceous matter, whilst thus vegetating; but onions, hyacinths, &c., with small surfaces of foliage, I as invariably have found to decrease in solid matters; the first obtain nourishment by decomposing the carbonic acid gas of the atmosphere, the latter do so in a much smaller proportion; hence the reason why the latter are so much more impoverishing crops than the former, inasmuch as they acquire nearly all their solid matter by means of their roots. These observations explain the conflicting statements of Saussure and Hassenfratz on this point, the former experimented with broad-leaved plants, the latter on such as have small foliage: the first maintained that plants increase in solid content when their roots are supplied with water only, the latter denied the fact. It has been advanced that water is the sole food of plants, but all experiments are inconclusive which are presented as supporting the theory. In the first place, all waters contain earthy, saline, and organic matters; even distilled water is not pure, as Sir Humphrey Davy has proved; and rain, Margraaf has demonstrated to be much less so. No plants growing in water only will ever perfect seed, and the facts, that different plants affect different soils, and that a soil will not bear through a series of years the same crop, whereas it will a rotation of different ones, demonstrate that they each take different kinds of food from the earth, and not that universal one, water, which is ever present and renewed.

Silica, or the pure substance of flint, is present in all soils; it is soluble in water, requiring one thousand times its weight of this liquid to dissolve it (*Kirwan's Mineralogy*, vol. i. p. 10); it is found in many plants, and in all the grasses that have been analyzed. Alumina, or the basis of clay, present in all soils, is soluble in water, so as to be inseparable by the filter, and is much more so when any of the acids are present (*Sennebier's Physiolog. Veget.* vol. iii. p. 18); it is found in plants in minute quantities, especially in the grain of barley, oats, wheat, &c. (*Schrœder in Gehlen's Journ.* vol. iii. p. 525). Lime is found in almost all soils; it is easily soluble in water, and there is but one plant which is known to contain none of it as a constituent, the *Salsola soda* (*Ann. de Chimie*, vol. xviii. p. 76). Magnesia, generally present in soils, is soluble in water, and is found in many plants. Iron is present in all soils, in all natural waters, and in all plants. Manganese is found in some soils; it is soluble in waters containing acids, &c., and is found in a few plants. But none of these, in a state of purity, either simply or combined, have ever been found capable of perfecting a plant through all its stages of growth, when moistened with distilled water; the contrary was the case, however, when the water contained in solution vegetable or animal matters, as the dung of animals. Now these matters contain carbon, hydrogen, oxygen, nitrogen, and various salts; the first three are absolutely necessary for the existence of all plants, every part of these is composed of them: nitrogen is found in some plants, and the importance of salts to vegetation is demonstrated by the fact, that clover will not flourish where there is no sulphate of lime; that nettles follow the footsteps of man for the nitrate of potass, which always abounds near the walls of his

habitation; and that marine plants linger for the common salts of their native haunts. Salts of some kind or other are found in every species of plant, but none that have not also been detected in soils. During decay, vegetable and animal matters exhale various gases. Carbonic acid, hydrogen, carburetted hydrogen, ammonia, &c. are of the number; all of which have been applied to the roots of plants with great profit by Sir H. Davey and others.

However varying in the proportions, yet every soil is composed of silica, alumina, lime, magnesia, oxide of iron, salts, and animal and vegetable remains. The most important consideration is, what proportions those are which constitute a fertile soil. The beau idéal of a fertile soil is one which contains such a proportion of decomposing matter as to keep the crop growing upon it always supplied with food in a state fit for intro-susception, yet not so superabundantly as to render it too luxuriant, if the object in view is the production of seed; but for the production of those plants whose foliage is the part in request, as spinach, or the production of edible bulbous roots, as onions, which have a small expanse of leaves, so as to be almost entirely dependent upon the soil for nourishment, there can scarcely be an excess of decomposed matter presented to their roots. Spinach, on rich soils, will yield successive cuttings, the same as asparagus; the latter especially demands abundant applications of nourishment to its roots; since, like the onion, it has little foliage and slightly-fibrous roots, at the same time that, like the spinach, it has to afford repeated cuttings, which requiring a repeated development of parts, need abundant food, and that in the immediate neighbourhood. A soil with a just proportion of decomposing matter, insures that it will be capable of absorbing moisture during the droughts of summer from the atmosphere, as the most fertile soils are always the most absorbent, yet it must not be too retentive of moisture, which is the case in such soils as contain too much alumina; neither must it too easily part with it, which is a characteristic of those which contain an excess of silica. A sub-soil of gravel mixed with clay is the best, if not abounding in oxide of iron; for clay alone retains the moisture on the arable surface in too great an excess; and sand, on the contrary, carries it away too rapidly. It is, however, evident that to ensure these desiderata in any soil, at all seasons, is impossible; and it is as manifest that a soil that would do so in one climate would fail in another, if the mean annual temperature of them should differ, as well as the quantity of rain which falls during the same period. In the western parts of England, more than twice as much rain occurs as in the most eastern counties, or in the proportion of 42 to 19; hence a soil in the east of England for any given crop may be richer and more tenacious than the one required for it on the western coast. Alumina, or clay, imparts tenacity to a soil when applied; silica, or sand, diminishes that power; whilst chalk and lime have an intermediate effect: they render heavy soils more friable, light soils more retentive. These simple facts are important; two neighbouring fields, by an interchange of soils, being often rendered fertile, which before were in the extrêmes of tenacity and porosity. From these statements it is evident that no universal standard or recipe can be given for the formation of a fertile soil, but one whose constituents approach in their proportions to those of the following one cannot be unproductive in any climate. It is a rich alluvial soil, which Mr. Sinclair, in his invaluable *Hortus Gramineus Woburnensis*, gives as being the most fertile for the grasses.

"Fine sand 115, aluminous stones 70, carbonate ot lime 23, decomposing animal and vegetable matter 34; silica 100, alumina 28, oxide of iron 13; sulphate of lime 2; soluble vegetable and saline matter 7, loss 8.—Total 400."

I have already stated what chiefly constitutes a fertile soil; it may be added that, to constitute one eminently such, its earthy particles must be in a minute state of division; the more so the more fertile it will be. In the above analysis 185 parts only were separable by sifting through a fine searce 215 parts were impalpable; whereas poorer soils will often have 300 parts coarse matter to every 100 of finely pulverised constituents.

In affording warmth to plants the earth is of considerable importance, and the power of accumulating and retaining it varies as much in soils as the proportions of their constituents. Sir Humphry Davy found that a rich black mould containing one-fourth of vegetable matter had its temperature increased in an hour from 65 to 88 deg. by exposure to the sunshine, whilst a chalk soil was heated only to 69 deg. under similar circumstances; but the first, when removed into the shade, cooled in half an hour 15 deg.; whereas the latter lost only 4 deg. This explains why the crops on light-coloured tenacious soils are in general so much more backward in spring, but are retained longer in verdure during autumn, than those on black light soils; the latter attain a genial warmth the more readily, but part with it with equal speed. An experiment which I have often repeated upon light as well as tenacious soils, with like success, demonstrates how greatly the colour of a soil influences the accumulation of heat. Coal-ashes were sprinkled over half the surfaces of beds sowed with peas, beans, &c., and on these the plants invariably appeared above ground two or three days earlier, obviously on account of the increased warmth; it being a well-known fact, that dark-coloured bodies absorb caloric more readily and in larger proportions than those of a lighter hue.

Different plants affect different soils. Every cultivator of the soil must have observed that there is scarcely an acre of his enclosures but has some particular crop, which it sustains in luxuriance far superior to any other in its neighbourhood, or to any other crop that can be grown in it. My own garden, without the preparation of an artificial soil, will not produce the common garden cress (*Lepidium sativum*), whilst the raspberry is remarkably luxuriant. That the composition of a soil has a main influence in these particularities is certain. The nettle haunts, as it were, the footsteps of man, and clings, as poetry might urge, in very sociality round his dwelling. This plant will not flourish but in a soil containing nitrate of potass (saltpetre), a salt always abounding in the neighbourhood of walls and places where there is calcareous matter. The rabbit-warrens near Mildenhall, in Suffolk, I have noticed frequently as abounding in nettles, yet it is a houseless waste of many miles extent, but still, nitrate of potass is furnished to the soil by the urine of the rabbits, which contains potass and lime in very considerable proportion. These topics, however, belong more properly to another division of our subject, Manures, which I shall next proceed to, because these ingredients of soils are strictly artificial or adventitious. It is certain that a soil is often considered unproductive, and that unproductiveness attributed to some deficiency in its staple, which is caused by erroneous management. I have before stated an instance of tap-rooted plants being produced of superior size and form, of applying the manure deep beneath the surface. In another instance, some parsneps, being of necessity sown in

a poor soil, having turned in some manure by trenching full twelve inches deep, I would not allow any to be applied to the surface; but at the time of thinning I set half the bed out at an average of twelve inches distance between each plant, the other half at nine inches; when taken up for storing the whole were alike perfectly fusiform, but those grown at twelve inches apart were the finest as 4½ to 3. If manure had been applied to the surface, the fibrous roots, I calculated, would be multiplied at the expence of the caudex, to its much greater detriment, than by making the few usually produced by this root extend in length by enlarging the circuit of their pasturage. Again, a more siliceous darker-coloured soil should be employed for the growth of an early crop of any given plant that is required by the main crop; because such soil will more readily get rid of the superfluous moisture, and acquire a more genial warmth, two great desiderata for vegetation in early spring. On the contrary, in autumn, for a late crop of peas for instance, the soil should be more aluminous; because in August, September, &c. atmospheric moisture, in the form of night dews, abounds, the foliage is therefore perpetually subject to alternate extremes of moisture and dryness, whilst the root is liable to a state of exceeding drought: the soil therefore should be rich, kept in a minute state of division by frequent hoeing, that moisture may be absorbed, and more aluminous that such moisture may be retained.

I shall now proceed to consider manures; a class of the first importance to the cultivator of the soil, yet of the economy of which he is generally most ignorant, inasmuch as that their judicious employment require considerable chemical acquirements. Every substance capable of increasing the fertility of a soil, when incorporated with it, is a manure; hence the earths, when applied to regulate its retentive powers, are actually manures, &c.

Manures are animal, vegetable, and mineral; they *directly* assist the growth of plants—1. By entering into their composition.—2. By absorbing and retaining moisture from the atmosphere.—3. By absorbing the gases of the atmosphere.—4. By stimulating the vascular system of the plants. Manures *approximately* assist vegetation—1. By killing predatory vermin and weeds.—2. By promoting the decomposition of stubborn organic remains in the soil.—3. By protecting incumbent plants from violent revolutions of temperature.

All these properties seldom if ever occur in one species of manure; but each is usually particularised by possessing one or more in a superior degree. That is the most generally applicable manure which is composed of matters essential to the growth of plants; the chief of these are carbon, hydrogen, and oxygen, therefore all animal and vegetable substances are excellent manures. It would evidently be of great benefit, if every plant could be manured with the decaying parts of its own species; the ancients made this a particular object in some parts of their agriculture. We read that those vines were the most fruitful which were manured with their own leaves and prunings, and the skins of expressed grapes (*Crescentius Agric.* § 2, c. 6). This rule might be so far followed as that the stems of potatoes, peas, &c. could be dug respectively into the compartments where those crops are intended to be grown in the following year.

The following Table shows the relative constitution of common stable manure, and our usual crops:—

Stable Manure.	*Crops.*
Carbon	These are the chief compounds of all plants.
Hydrogen	
Oxygen	
Nitrogen.	In some vegetables.
Carbonate of Lime.	In almost all plants.
Carbonate of Soda.	
Benzoate of Soda.	
Muriate of Potas.	In cucumbers, garlic, &c.
Muriate of Soda.	Perhaps in all plants.
Sulphate of Soda.	
Sulphate of Potash.	In cucumbers, garlic, &c.
Magnesia.	In all corn, and many other plants.
Phosphate o. Lime.	Potatoes, onions, &c, &c.
Oxide of Iron.	In most plants.
Alumina.	
Silica.	

Stable manure, and for the same reason every other manure composed of animal or vegetable remains, is evidently valuable to plants by affording them such matters as they are composed of. But this is not the only reason that manures are beneficial; for in that case, mere decayed parts of their own species should be the most fertilising applications. There is no doubt that plants are essentially benefitted by such applications; but why do potatoes, for example, grow more luxuriant on ground manured with sprats, than on that manured with the dung of horses, and both these superior to the same crop grown on a plat manured with the decayed parts of its own species? Apparently, because the manures mentioned decompose with a rapidity exactly proportioned to the order of benefit. Sprats decompose and their parts become soluble and capable of introsusception, first and most rapidly; then the dung of animals; lastly the vegetable remains. All the less solid animal matters decompose with greater rapidity than vegetable matters: hence the dung of such animals as are carnivorous is the most prompt in benefiting vegetation; witness night soil, pigs' dung, &c. but such manures are not the most permanent. Hassenfratz manured two portions of the same soil, No. 1, with a mixture of dung and straw highly putrified, No. 2, with a similar mixture, newly made. He observed that during the first year No. 1, produced the best crop, but the second year (no more dung being added), No. 2 produced the best crop; the result was the same the third year, after which both seemed alike exhausted, (*Ann. de Chimie*, xiv. 57.) The same chemist found that a soil manured with wood shavings did not during the two succeeding years, produce a superior vegetation than the same soil without any manure; the third year, however, it was better; nor was it until the fifth year, that it reached the maximum of fertility. The site of a wood stack, and the newly cleared lands of America, are eminently fertile from the gradually decomposing vegetable remains they contain.

These facts and observations teach us that the most prompt manures are the reverse of being economical; vegetable remains, incorporated with a soil, will ensure an average produce during several years; animal matters and dungs highly putrescent, are powerfully, but transiently beneficial. Putrefaction is evidently the means of rendering these substances available to plants; hence thoroughly-decayed stable manure is usually employed by gardeners, as being of immediate benefit, admitting of clean husbandry, and as economy is not in private establishments the general presiding genius of the garden. If stable-dung, or other manure, is

allowed to putrify in an unenclosed heap, the loss is immense; all the gases which pass off during decomposition, all the soluble matters which drain away, are highly nutritious to plants, as has been proved by Davy and others. If the decomposition is thus allowed to proceed until the heap becomes a saponaceous mass, the loss cannot be less than 50 per cent. Notwithstanding all the reasoning of chemists, however, putrefied dung will continue to be used; it admits of clean workmanship with less labour, and ensures a good immediate crop. To prevent loss as much as possible, therefore, the dung-heap should be in a brick cistern, and covered over with earth at least nine inches deep, with a well at one corner to retain the drainage, which from time to time should be returned over the heap.

The chief component of plants is carbon, and we shall not be far wrong if we estimate it as constituting 50 per cent. of every vegetable; it is the decayed organic remains of the soil, which supply a considerable proportion of this to the growing plants. It is a subject of debate amongst chemists, how the carbon of manures is imbibed by plants. Carbon, say they, is insoluble, and experiment has demonstrated that the roots cannot absorb it in a solid state. Sennebier, having observed that water impregnated with carbonic acid, when applied to the roots of plants, was beneficial, concluded that the carbon of manures is converted into carbonic acid, and is in that state imbibed by them.—(*Phys. Vég.* v. iii. p. 55).

Thomson, in an early edition of his "*System of Chemistry*," gave a still more elaborate theory, which being in subsequent editions omitted, we have no necessity to demonstrate absurd. I consider that the facts of which we are in possession, if progressively estimated, place the subject in a very clear light. Saussure found that a soil deprived of its soluble matters by repeated décoctions with water, would not support vegetation so well as that portion of the same soil not so deprived of its soluble constituents (*Recherch sur la Veg.* c. v. § 11, p. 170). The extract thus obtained was evidently composed of saccharine matter, mucilage, extractive principle, &c. These we know are nutritive to plants, and are elaborated and assimilated by them after introsusception. Now vegetable substances, as straw, &c. gradually yield these soluble matters as they decay. Straw, wood, leaves, &c. consist chiefly of woody fibre; to convert this into saccharine and mucilaginous matters is the work of putrefaction; to effect this, oxygen must be absorbed, and the extra proportions of carbon be got rid of, as is evident from the following table of constituents:—

	Woody Fibre.	*Gum.*	*Sugar.*
Carbon	52.53	42.23	27.5
Oxygen	41.78	50.84	64.7
Hydrogen	5.69	6.93	7.8
	100.00	100.00	100.0

That such processes do occur, Saussure has demonstrated by experiment: he found that moist wood exposed to the air absorbed oxygen, evolved carbonic acid, and water was evidently decomposed. Thus, their putrefaction seems to render organic matters fit for the nourishment of plants by converting them into saccharine and mucilaginous compounds capable of solution in water. Hence the phenomenon of wood, which is slow of decomposition, being a permanent manure; animal matters, which rapidly putrefy, being transient though temporarily powerful; hence the

economy of using partially decomposed composts is also rationalised: when completely decomposed, its soluble matters being more than can be consumed at the time by the crop, pass away with the drainage water; much is lost in the state of gas, and all that is left are a few earthy saline and carbonaceous particles, of comparatively little value.

Of the less-general manures, which benefit plants by entering into their composition, a few words will suffice. Sulphate of lime (gypsum) is a component of clover, lucern, turnips, &c.; hence it has been applied, with benefit, for these crops to such soils as did not already contain it. Bones, broken small, have lately become a very general manure; their benefit, which is very permanent, is easily accounted for. The bones of oxen contain about fifty per cent of gelatine, which is soluble in water, and rapidly becomes putrescent; the remainder is chiefly phosphate and carbonate of lime, salts which are components of wheat, rye, barley, oats, peas, beans, vines, cucumbers, potatoes, garlic, onions, truffles, &c. Common salt also is employed as a manure, and is beneficial, partly in consequence of entering into the constitution of plants.

I shall now proceed to consider manure as being beneficial to vegetation, by absorbing and retaining moisture from the atmosphere.

Some manures ameliorate a soil by absorbing moisture from the atmosphere. This property is, at least, as beneficial to ground that is aluminous as to that which is siliceous; for it is equally useless to either during such periods of the year as are characterised by a plentiful deposition of rain; but in the droughts of summer, when moisture is much wanting to plants, it is beneficial to both: in very dry seasons it is even of greater importance to clayey soils than to light ones, for vegetation on the former suffers more from long-continued drought than on the latter, inasmuch as that moisture being equally exhaled from each, the surface of the clayey soil becomes caked and impervious to the air, which is the only grand source of compensatory moisture that is available to the languishing plants, and which is more open to those which grow on light and consequently more pervious soils.

The following table of the comparative absorbent powers of many manures, &c. is chiefly extracted from *An Essay on the Uses of Salt in Agriculture*, &c., by my brother, Mr. C. Johnson:—

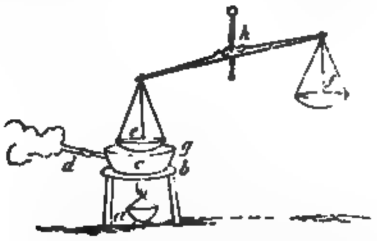
		Parts.
1000 Parts.	Horse dung evaporated previously to dryness at a temperature of 100 deg. absorbed during an exposure of three hours to air saturated with moisture at 62 deg.	145
	Putrefied tanner's bark under similar circumstances (66 deg.)	145
	Unputrefied ditto	115
	Cow dung	130
	Pig ditto	120
	Sheep ditto	81
	Pigeon ditto	50
	Refuse marine salt (60 deg.)	49½
	Soot (68 deg.)	36
	Burnt clay	29
	The richest soil (in one hour)	23*
	Coal ashes	14
	Lime (part carbonate)	11
	Crushed rock salt	10
	Gypsum	9
	Chalk	4

* Sir H. Davy.

The absorbing power of manure is much influenced by the state in which it is presented to the atmosphere. In a finely-divided state, mere capillary attraction assists it; hence, as we have before insisted, the importance of keeping the soil frequently stirred by hoeing, &c. The most ancient Roman agriculturists were aware of this. "What is good tillage?" says Cato, in his *De Rustica*, "*To plough.* What is the second thing? *To plough.* The third is to manure." But a mere mass of cotton, by means of capillary attraction, will absorb moisture from the air, yet it parts with it at a very slight elevation of temperature; it is of importance, therefore, to ascertain which are the manures that not only absorb but *retain* moisture powerfully. The following results of my experiments throw some light on this point.

		Minutes.
10 Parts.	Pig dung evaporated to dryness at a temperature of 106 deg. and then moistened with six parts of water, required for being reduced to dryness again at the above temperature	136
	Horse dung under similar circumstances	90
	Common salt	75
	Soot	75
	Rich soil	32
	Chalk	30
	Poor soil (siliceous)	23
	Gypsum	18

These experiments point out a criterion by which we easily ascertain the comparative richness of any two given soils or manures; the most fertile will be the most absorbent and retentive. The annexed sketch represents the apparatus I have found the best adapted for ascertaining the retentive powers of soils:—



a, Represents a small lamp; *b*, a tripod for supporting a small tin vessel *c*, which has a small hole and plug at *g*, for the purpose of filling it with water; and a small pipe *d*, for the escape of the steam when the water is brought to a boiling temperature; *h* is a small pair of grain scales. To ascertain the moisture-retaining power of a soil, put ten grains of it, previously dried by exposure to a temperature of 212 deg. (the boiling point of water) for half an hour, by having it laid upon *c*, whilst the water within it is kept boiling for that period. On the ten grains of previously dried soil, put by means of a small quill, three drops of clean water; ascertain the exact weight of these, usually four grains; then suspend the beam, so that the pan of the scales containing the soil may rest upon *e*, as represented in the sketch, the weight of the water having been previously removed from the other scale pan *f*. The water in *c* must be kept boiling, and the exact number of minutes noted that is required to evaporate the added moisture, so as to return the beam into equilibrium. I have always found those soils proportionably unproductive, the first from containing too much alumina, and the second from a redundancy of silica, as they required more than fifty minutes, and less than twenty-five minutes, to deprive them of half their weight of moisture.

Some manures increase the growth and vigour of plants by stimulating their absorbent and assimilating organs. This will only be admitted by those who, like myself, allow that plants are gifted with sensation; space cannot be permitted me to argue as I would to those who dissent from this opinion; but a few facts, as enumerated in my *Outlines of Botany* (*Gard. Mag.* vol. ii. p. 330), will, I think, demonstrate that it is impossible to deny that they possess [illegible] of sensation. "The Venus's fly-trap (Dionæa muscipula) has jointed [illegible] furnished on their edges with a row of strong prickles. Flies, attracted

by honey which is secreted in glands on their surface, venture to alight upon them; no sooner do their legs touch these parts, than the sides of the leaves spring up, and locking their rows of prickles together, squeeze the insect to death. The well-known sensitive plant (Mimôsa sensitiva) shrinks from the slightest touch. Oxalis sensitiva and Smithia sensitiva are similarly irritable, as are the filaments of the stamens of the barberry. One of this sensitive tribe, Hedysarum gyrans, has a spontaneous motion; its leaves are frequently moving in various directions, without order or co-operation. When an insects inserts its proboscis between the converging anthers of a kind of Dog's bane (Apocynum androsemifolium) they close with a power usually sufficient to detain the intruder until his death." The more I study the phenomena of vegetation, the more I feel convinced on this point. How often have I heard a farmer reply to an observation on the tardy growth of turnips,—"They will not grow apace until their leaves are large enough for the wind to take hold of them;" and this is only because plants cannot be healthy and vigorous without exercise. Mr. Knight found that trees which were regularly shaken every day in his green-house, grew more rapidly and stronger than others which were kept still.

The stimulating powers of excrementitious manures arise from the salts of ammonia they contain. Sir H. Davey found vegetation assisted by solutions of muriate of ammonia (sal ammoniac), carbonate of ammonia (volatile salt), and acetate of ammonia. Night soil, one of the most beneficial of manures, surpasses all others in the abundance of its ammoniacal constituents in the proportion of three to one. It may be observed that the nearer any animal approaches to man in the nature of its food, the more fertilizing is the manure it affords. I have no doubt that a languishing plant, one, for example, that has been kept very long with its roots out of the earth, as the orange trees imported from Italy, &c. might be most rapidly recovered if its stem and branches were steeped in a tepid weak solution of carbonate of ammonia; and, when planted, an uncorked phial of the solution were suspended to one of the branches, to impregnate the atmosphere slightly with its stimulating fumes.

Manures are of benefit to plants, by affording some of the gases of the atmosphere to their roots, in a concentrated form. A soil, when first turned up by the spade or plough, has generally a red tint, of various intensity, which, by a few hours exposure to the air, subsides into a grey or black hue. The first colour appears to arise from the oxide of iron, which all soils contain, being in the state of the red, or protoxide; by absorbing more oxygen by the exposure, it is converted into the black, or protoxide. Hence, one of the benefits of frequently stirring soils: the roots of incumbent plants abstract the extra-dose of oxygen, and reconvert it to the protoxide. Coal-ashes, in common with all carbonaceous matters, have the power of strongly attracting oxygen. Every gardener may have observed how rapidly a bright spade becomes covered with rust, or red oxide, which is left foul with coal-ashes. All animal and vegetable manures absorb oxygen from the air during putrefaction. If it is inquired of what benefit this property is to plants, since the gases are freely presented to them in the atmosphere, it admits the ready answer,—that they enjoy the additional quantity which is thus collected to the vicinity of their roots, without the latter source being diminished; and that plants are benefitted by such additional application to their radiculæ, has been proved by the experiments of Mr. Hill, quoted in a previous part of these outlines. The question may also be asked, whether the roots have the power to extract the oxygen from its combination. That they have, admits of little doubt, since Saussure found that they were able to extract various saline bodies from their combinations; and not only extracting, but selecting in those cases were several salts where in the same solution. Carbonic acid is also of benefit to plants, when applied to their roots in an advanced stage of their growth. Animal and vegetable matters evolve this gas while putrefying; but I am not aware of any manure that absorbs it from the atmosphere, so as to be for that reason beneficial to vegetation. Lime attracts it rapidly, but combines with it so strongly that it is useless to the plant, until the carbonate of lime so formed is imbibed and elaborated.

Manures assist plants, by destroying predatory vermin and weeds. This is not a property of animal and vegetable manure; they foster both these enemies of our crops. Salt and lime are very efficient destroyers of slugs, snails, grubs, &c. It is astonishing how ignorantly neglectful are the cultivators of the soil, when the crops are destroyed by the slug, not to dress them so as to render the surface of the soil quite white, during a promise of a few days' dry weather, with caustic lime. It is instant destruction to every slug it falls upon, and those whom it misses are destroyed by their coming in contact with it when moving in search of food. It is a common practice to burn couch grass, docks, gorse, and other vegetables which are very retentive of life, or slow in decay: a more uneconomical, unscientific method of reducing them to a state beneficial to the land of which they were the refuse, cannot be devised. In breaking up heaths such exuviæ are very abundant; but, in all cases, if weeds, leaves, &c. were conveyed to a hole or pit, and with every single horse-load, and barrow-load in proportion, a bushel of salt and half a bushel of lime were incorporated, it would, in a few months, form a mass of decayed compost of the most fertilizing quality; the lime retaining many of the gases evolved during the putrefaction of the vegetable matter, and the salt combining with it to destroy noxious animals which might form a nidus in the mass. By this plan, nearly all the carbonaceous matters of the refuse vegetables are retained; by burning, nearly all of them are dissipated. The forming of a compost such as that recommended, is justified and approved by the experience of many.

Stable manures, and all decomposing animal and vegetable substances, have a tendency to promote the decay of stubborn organic remains in the soil, on the principle that putrescent substances hasten the process of putrefaction in other organic bodies with which they come in contact. Salt, in a small proportion, has been demonstrated, by Sir John Pringle, to be gifted with a similar septic property: and that lime rapidly breaks down the texture of organised matters is well known.

There is no doubt that rich soils, or those abounding in animal and vegetable remains, are less liable to change in temperature with that of the incumbent atmosphere than those of a poorer constitution. This partly arises from causes explained when treating of the influence of the colour of soils upon vegetation. Some manures, as salt, protect plants from suffering by sudden reductions of temperature, by entering into their system, stimulating, and rendering them more vigorous, impregnating their sap, and, consequently rendering it less liable to be congealed.—(*Johnson's Essay on the Uses of Salt*, edit. 3, p. 6.)

Every cultivator of the soil, by certain empirical signs, may be able to determine that certain applications are required to render his land productive; for example, he knows when chalk may be employed to advantage; but no lengthened practice has yet enabled any one to judge of the quality of a chalk by its exterior appearances. Chemistry alone can do this. The farmers of a district in Yorkshire having experienced the benefit of lime, procured some from a neighbouring kiln, and were astonished to behold the injury it did to their crops; and it remained an anomaly of their experience, until chemistry demonstrated that it contained a very large proportion of magnesia, which, absorbing carbonic acid very slowly, remained in a caustic state, to the injury of the roots of the plants, and the diminution of the benefit from the carbonic acid evolved by the decomposing constituents of the soil.

Every farmer in districts where marl is to be obtained, is aware that it is highly beneficial when applied to the land; few of them however, know that this various-coloured compound of earths contains always chalk, often to the amount of 50 per cent. They learn, from experience, that the marl of one district is most beneficial to their heavy soils; that of a second district is productive of most benefit upon light land: yet they were ignorant, in the first instance, that the first marl contains silica, or sand; that the second has alumina, or clay, as a component; and if a new pit of marl is opened, they have to wait the result of some years' practice before they ascertain its quality. The chemist can inform them in an hour.

I now proceed to consider those parts of plants which are apparent above ground. These consist of the stems, branches, leaves, flowers, and fruit.

Of the first two, it may be primarily necessary to sketch the anatomy. The *epidermis* is analogous to the human cuticle or scarf-skin, being the external envelope of the whole surface. It is commonly transparent and smooth, sometimes hairy; in other instances hard and rugged, occasionally so abounding with silica or flint, as to be employed as a polisher for wood and even brass. In every instance it is a net work of fibres, the meshes of which are filled with a fine membrane. The epidermis appears to be designed as a preservative from the injurious effects of the atmosphere, to regulate the quantity of gaseous matter and moisture respired, and as a shield from the attacks of animals, &c. It is certainly devoid of sensation. The texture of the membrane within the meshes varies much in different species of plants. In very succulent plants, it is so contrived that it readily allows the absorption of moisture, but prevents perspiration. Such plants are, consequently, well qualified to inhabit hot climates and dry soils. Neither is it at all impossible that it possesses the quality of allowing the passage of some gases, and rejecting others, as the bladder of animals permits water to pass through its texture, but is impervious to alcohol. In old trees it cracks, and in many cases, becomes obliterated, the dead layers of bark performing its offices. Immediately beneath the epidermis occurs the *cellular integument* (otherwise known as *parenchyma* and *pulp*) It is a juicy substance, and being the seat of colour, is analogous to the rete mucosum of man; which is red in the white, and black in the negro. The moss of apples, &c. is composed of it. Leaves are chiefly formed of a plate of it, enclosed by epidermis. In herbs, succulent plants, leaves and fruits, if it is destroyed, unlike the epidermis of the same, it remains unrestored; but in the case of trees and shrubs, it is generated after each removal. In leaves it is generally green; in flowers and fruits, of every hue. It is always cellular, and evidently acts a part in the secretory system of plants.

Under the cellular integument occurs *the bark*, which, in annual plants, or branches of one year's growth, consists of a single layer, scarcely distinguishable from the wood; in older stems and branches, it is composed of as many layers as they are years of age. It is in the innermost of these, which is called the *liber*, that the vital returning circulation and secretions are carried on for the time being, almost exclusively. These layers are concentric, or, as they are usually termed, *cortical layers*; they are thicker in feeble plants than in more vigorous ones of the same species; they are formed of waving longitudinal fibres, the meshes of the network they thus constitute being filled with pulp. If the outer bark is destroyed, but the wound does not penetrate below the liber, the wound is healed up, otherwise the removed part is unregenerated. In some roots, though only annuals, the bark is composed entirely of liber, and is very thick, as in the carrot or parsnip, in which it is evidently separated by a light-coloured annular mark, from the central or woody part. The liber is composed of various longitudinal tubes, in which the true sap of the individual descends after elaboration in the leaves; consequently, here are found the substances that are the peculiar products of each in the most concentrated state, as the resin of the fir, the bitter principle of the cinchona, or Peruvian bark, &c. I will here pause, to remark upon some of the remedies which have been recommended for the removal of insects from the bark of trees. Oil has been directed to be smeared over them, for the destruction of the aphis lanigera, moss, &c. Whether it will answer such purpose I will not stop to argue, but will content myself with observing that a more deleterious application is impossible; for, on the same principle that it destroys the parasites, namely, by closing their spiracles and pores, and thus suffocating them; it, in a like manner, clogs up the pores of the infected tree, and, in every instance, insures a weak and unhealthy vegetation; for it is not a transient remedy, that will cease in its effects as soon as it has attained the desired end. The oil dries and, as it were, forms a varnish over the epidermis for years, unremoved by exposure to the atmosphere; and this effect is more decidedly insured, by linseed oil being the kind recommended, it being one of the most unctious and quick-drying of the oils. The most effectual, most salutary, and least disagreeable, is a remedy of trivial expence, and which a gardener need but try upon one

individual to insure its adoption. It is, with a hard brush, dipped in a strong brine of common salt, as often as necessary, to insure each portion of the bark being moistened with it, to scrub the trunks and branches of his trees at least every second year. It most effectually destroys insects of all kinds, and moss; and the stimulating influence of the application and friction is productive of the most beneficial effects. The expence is not so much as that of dressing the trunks with a solution of lime, which, however efficient in the destruction of moss is not so in the removal of insects; is highly injurious to the trees, by filling up the respiratory pores of the epidermis; and is decidedly a promoter of canker. Let my remedy be brought by every orchardist to the test of experiment, *under his own eye*, that it may be effectually done, and he will not require me to theorise. Facts are stubborn opponents. If the fibres emitted by the ivy, by which they cling to other trees for support, do not aid it in obtaining nourishment, yet, by filling the respiratory pores, they are injurious, and for other reasons should never be allowed to cling around serviceable trees. The belief that ivy draws no sustenance to itself by the attaching fibres, I cannot however subscribe to. Attached to the officers' barracks at Winchester, is a very fine specimen of ivy; its trunk has been severed off to a height of more than two feet from the ground, yet it has for years continued a healthy vegetation. That the fibres have become real roots in the interstices of the wall, which is built of flints and mortar, I will not dispute; but that is only confirmatory of my belief that the ivy gains nourishment by their means.

Immediately beneath the bark is situated *the wood*, which forms the chief bulk of trees and shrubs. It is formed of concentric layers, one at least of which is added annually. These layers are formed of a tissue of longitudinal fibres, resembling network, the interstices of which are filled up with soluble matter, differing in each vegetable genus, but closely resembling its parenchyma. The layer immediately in contact with the bark is the softest and palest in colour, and thence is called *the alburnum*. It is in this that the vessels which convey the sap from the roots to the leaves are chiefly situated. This layer is annually renewed, that of the previous year becoming more complete wood. Although the chief part of the sap vessels, as just observed, is situated in the alburnum, yet others, though more scanty, are dispersed through the whole of the wood. Wherever situated, they extend from the extremity of the minutest root to the leaves. The idea that the annual layer of wood is rendered more dense and firm by severe winters, is denied by reason and demonstrated to be false by actual observation. The layers are thickest on those sides of a tree where the largest branches occur, and are throughout of greater size in such years as afford the most genial period to vegetation.

In the centre of the wood is situated the *medulla* or *pith*, it is a soft cellular membranous substance, juicy when young, and extending from the ends of the roots to the extremity of the branches. In the first stages of vegetation, it occupies but a small space; it gradually dilates; and, in shoots of a year old, and in young trees it is of considerable diameter; as their age increases, it gradually diminishes, and at length becomes totally extinct, its place being occupied by perfect wood. Its functions are little understood. It appears to be connected with the production of young shoots; for as soon as it becomes extinct in a branch, that member loses, in a great degree, the power of producing them; that power apparently being transferred to those younger branches that still retain their pith in perfection.

The stem is by no means an essential part of a plant, since many are destitute of it, to such trees as naturally are gifted with one, it is somewhat injurious to prevent its formation. Standard fruit trees, under similar circumstances of soil, season, and culture, generally produce finer-flavoured fruit than either dwarf standards, or espaliers. The fact appears to be accounted for by the discoveries of the indefatigable Knight, which evince that plants during the latter part of the summer are employed in preparing nourishment for the production of the foliage and blossom in the succeeding spring; this nourishment is perfected and deposited in the alburnum, and mixes with the sap during its ascent in that season; of a consequence it is found to increase in density proportionate to the height at which it is extracted.

The leaves are highly vascular organs, in which are performed some of the most important functions of a plant. They are very general, but not absolutely necessary organs, since the branches sometimes perform their offices; such plants however as naturally possess them, are destroyed or greatly injured by being deprived of them. The duration of a leaf is, in general, but for a year, though in some trees, &c. they survive for twice or thrice that period. These organs are in general of a green colour. Light seems to have a powerful influence in causing this; since if kept in the dark, they become of a pale yellow, or even white hue, unless uncombined hydrogen is present, in which case they retain their verdure though light is absent. Hence their etiolation would seem to arise from their being unable to obtain, under ordinary circumstances, this gas, except when light is present. Now the only source from which they can obtain hydrogen, is by decomposing water; and how light assists in the decomposition, may, perhaps, be explained by the disoxygenising power with which it is gifted. The violet rays of the spectrum have this power in the greatest degree; and Sennebier has ascertained by experiment, that those rays have the greatest influence in producing the green colour of plants. When leaves are of any other hue than green, they are said to be *colored*. This variation is often considered to be a symptom either of tenderness or debility; and it is certain when the leaves of a plant become generally white, that that individual is seldom long-lived. Mr. Knight, however, has demonstrated that variegation is not a certain indication of a deficiency of hardihood.

The functions of the leaves appear to be a combination of those of the lungs and stomach of animals; they not only modify the food brought to them from the roots, so as to fit it for increasing the size of the parent plant, but they also absorb nourishment from the atmosphere. The sap after elaboration in these organs, differs in every plant, though, as far as experiments have been tried, it appears to be nearly the same in all vegetables when it first arrives to them. The power of a leaf to generate sap is in proportion to its area of surface, exposure to the light, and congenial situation.

Leaves throw off a very considerable quantity of water. Dr. Hales found that a cabbage emitted daily nearly half its weight of moisture, and a sun flower, three feet high, perspired in the same time 1 lb. 14 oz. But of all the plants of which the diurnal perspiration has been ascertained, the Cornelian cherry (Cornus mascula) transpires the most, the exhalation amounting to nearly twice the weight of the plant in twenty-four hours. This aqueous expiration takes place chiefly during the day; is much promoted by heat, and checked by rain, or a reduction of temperature.

On the free performance of this function of plants their health is dependent in a very high degree; and I believe that half the epidemics to which they are subject arise from its derangement. The clubbing of the roots of the Brassica tribe, I consider, arises partly from it. In the drought of summer, when the moisture supplied to a cabbage by its root, does not any thing near equal the exhalation of its foliage to supply the deficiency, the plant endeavours, by forming a kind of spurious bulbous root, to adapt itself to the contingency in the same manner that in dry situations the fibrous roots of Phleum pratense, Alopecurus geniculatus, &c. acquire a tuberous form, as bulbous or tuberous rooted plants, it is well known, will exist in a soil so deficient in moisture, as to destroy all fibrous-rooted vegetables.

Evergreens transpire less moisture than deciduous plants, which would lead to the expectation that they are more capable of living in dry situations, which really is in general the case.

Leaves have the power of absorbing moisture as well as of emitting it, which power of absorption they principally enjoy during the night.

During the day, leaves also absorb carbonic acid gas, which they decompose, retaining its carbon, and emitting the greatest part of the oxygen that enters into its composition. In the night this operation is in a certain measure reversed, a small quantity of oxygen being absorbed from the atmosphere, and a yet smaller proportion of carbonic acid emitted.

The hints and warnings which these facts suggest to the mind of every reflecting practitioner are numerous. They explain and enforce the necessity of a regular, and by no means as to quantity indiscriminate, supply of water to plants wherever practicable. The importance of shading after their transplanting, and of a free circulation of air, &c., and the necessity of keeping the leaves as clean, and as free from injury as possible. The leaves of plants must often be removed, and in some instances this is done with essential benefit, but the horticulturist should constantly keep in mind that with every one that he removes, he deprives the plant of a primary organ of its existence. Light, it has just been stated, is the cause of the green colour of plants, but it should be observed that its full power is only beneficial when directed upon their upper surface. This is evidenced by the position they always maintain. If the branches of a tree, trained against a wall or other support, are so moved, when their leaves are completely expanded, that the underside of the foliage is most exposed to the light, they are always found to regain their natural position in a day or two. If the experiment is often repeated on the same individual, the leaves to the last continue to revert, but become gradually weaker in the effort, partially decay, and their epidermis peels off. Succulent leaves are particularly sensible of light, but those of pinnated leguminous plants are still more so.

The *flowers* and *seeds* are those essential parts of a plant by which it is preserved from extinction. Linnæus has compendiously designated the parts of fructification "a temporary part of vegetables, terminating the old individual and beginning the new;" a definition, however, only strictly true when applied to annuals.

The *petals* of the flower evidently act an important part in nourishing the more essential parts of fructification, since if they are removed from the plants naturally possessing them, I am not aware of a single instance in which the seeds will advance a grade farther towards maturity. The *stamens* and *pistils* are the most essential parts. The first are the members that secrete the pollen or fecundating dust, without the application of which to the pistils, the seed is never fertile. It is the *anther*, or summit of each stamen, that secretes this fecundating matter. The pollen appears to the unassisted vision, merely a fine powder; but in fact, each grain is commonly a membranous bag, varying in form in different species. Pollen is chiefly discharged from the anthers during dry warm weather. but each vesicle of it remains entire until it comes in contact with moisture, when it immediately bursts, and discharges its minute particles in a form absorbable by the small ducts of the pistil. The necessary degree of moisture usually exists upon the summit of the pistils to which the bags of pollen cling, and thus more securely determine the impregnation of the seeds. We are

furnished, by a knowledge of these facts, with a reason for the great injury done to orchards, &c. by excessive wet weather during the time of flowering. The pollen is washed away from the anthers, as it is secreted, and exploding at the instant, either does not settle at all upon the pistils, or alights upon them whilst loaded with unnatural moisture, which is again shaken off, or is prevented entering their orifice. They warn us, also, from watering or disturbing unnecessarily the herbage of plants under our care whilst they are in bloom. It is a fact of some importance to be known by the cultivators of hybrids and new varieties, that in dry weather pollen may be conveyed to a considerable distance uninjured. This is demonstrated by many observations on accidental impregnations by the agency of winds, &c., and still more decidedly by Linnæus, who kept some of the pollen of the Jatropha urens in paper for more than a month, which afterwards fertilized the pistils to which it was applied. In the present general diffusion of botanical knowledge, it seems almost trite to observe, that the seed grower should neither exterminate the barren plants of the diœcious class, as in spinach, asparagus, &c. nor remove the unfertile flowers of cucumbers, &c.; for without these, the female blossoms would be equally unproductive. Many insects are highly injurious in the hot-house, &c., to the plants they contain; but an indiscriminate destruction is not to be recommended. Many of them bear pollen on their wings to female flowers which otherwise would remain unimpregnated. The humble bee, above all other insects, I would have befriended, for its robust and hardy form enables it to get abroad and be employed in this useful work, when weaker insects are confined by inclement weather.

The stamens are changed into petals in double flowers, which are consequently unfertile: they are often likewise obliterated, either by excessive nourishment, or when the plant increases much by root, as in the Fiery Lily (Lilium bulbiferum). If this excessive production of root is very remarkable, it sometimes prevents the production of the flowers of the plant entirely, as is the case with some early varieties of the potatoe; for Mr. Knight demonstrated that if the tubers of such were removed as they were produced, the plants blossomed as freely as later-tubering varieties; and vice versa, the removal of the blossoms of tuberous-rooted plants promotes the size and number of the tubers. It is not to be supposed, however, that fibrous-rooted plants, are not similarly affected. I have observed a gooseberry bush, that from being under the shade of trees, &c. had never borne fruit for a series of years, to throw out annually a very excessive number of suckers. Again, fibrous-rooted land plants, which by accident are growing in water, increase the number of their radiculæ enormously, whilst their fructification is diminished and abortive in proportion.

Of the pistils, the two essential parts are the *stigma*, or orifice for the admission of the pollen, generally on the summit; and the *germen*, which is the rudiment of the future seed-vessel. Pistils, like stamens, are obliterated in double flowers, otherwise they are not so liable to become petals.

The production of the *seed* is "the being's end and aim" of every plant: all its other parts, by ministering in some way or other to its maturity, indicate its importance. Not perceiving that a description of the various parts of a seed would lead to any practical hints to the gardener, I shall proceed to the consideration of the phenomena of *germination*.

When a seed is placed in a situation favourable for vegetation, it soon swells, its skin, or *testa*, burst, and a shoot denominated the *radicle*, is protruded; and, in a short time, this is followed by a second, which is named the *plumula*. The radicle by degrees sinks into the earth, and becomes a perfect root; whilst the plumula rises above the surface, to expand, and complete the form of the perfect plant. The essentials for germination are several. The first of these appears to be the perfect maturity of the seed; for, although Sennebier found that peas will sometimes vegetate, though sown in a green and soft state, yet it is certain that the plants raised from immature seed, are always weak in their growth, and unproductive. Some seeds require to be sown immediately after they ripen. The coffee-bean, and the seeds of angelica and fraxinella, refuse to germinate if not sown in five or six weeks after they have been gathered; but by far the majority of seeds retain their powers of vegetating, if carefully preserved, for years. Home sowed barley has vegetated after being gathered 140 years. Farinaceous seeds, that is, such as contain a large proportion of starch, usually are those which retain their vitality the longest, (barley, wheat, and oats, are of this number,) inasmuch as that constituent is very slow in decomposing. Oily seeds, and those enclosed in juicy berries, or other seed vessels of a mucilaginous or saccharine quality, are the most liable to spoil. It is to be observed, that for the gardener, old seed is sometimes desirable; the plants from it run less luxuriant in foliage, and produce their blossoms and fruit more early than those from new seeds: hence for melons, early and late crops of peas, &c., seed that is a year or two old is to be preferred.

No seed will germinate without oxygen gas, moisture, and a certain degree of heat are present. The requisite proportions of these vary in different individuals; but, in the total absence of any one, no seed will advance a single grade in vegetation. When all are present to a seed, carbonic acid gas is evolved, and oxygen absorbed. This gas is afforded to the seed from the atmosphere, in which we shall see hereafter, it exists in the proportion of about twenty-one per cent. From the experiments of Saussure we learn that weight for weight, wheat and barley during germination absorb less oxygen than peas; whilst these consume less than beans and kidney-beans. The first two may, therefore, be buried at a greater depth below the surface of the earth, than the last three, without vegetation being prevented; for

it is the want of a due supply of oxygen, at great depth from the surface, that prevents the germination of seeds so buried. Seeds that are thus situated, however, will often retain their vegetative power for an apparently unlimited period: hence earth taken from a considerable depth, will often, when brought to the surface, be covered with thistles, charlock, &c. In botanic gardens, plants that were supposed to be lost to the establishments, have often been recovered by the casual digging over borders where they had been grown, some of their seeds having been buried in by a previous turning over of the soil. Seeds abounding in oil have been observed to retain their vitality the longest when so buried.

Oxygen gas is so essential to germination, that any application to seeds that afford it to them in abundance, greatly accelerates the process: hence, M. Humboldt found that chlorine, which yields abundance of that gas when in contact with water, by combining with its hydrogen, and setting the oxygen at liberty, produced this acceleration of vegetation. At Vienna, several seeds which were of considerable age, and had constantly refused to germinate, did so readily when treated with it. Plants, when raised from such seeds, are undoubtedly more weak than others raised from seed in which no such extra stimulus is required. Mr. George Sinclair, author of the excellent Hortus Gramineus Woburnensis, however informs me that he has employed chlorine with singular success. He obtains it by mixing a table-spoonful of muriatic acid, with a similar quantity of black oxide of manganese and half a pint of water. After allowing the mixture to remain two or three hours, the seed is to be immersed in the liquid for a similar period, and then sown. Another, and I consider the most eligible mode of applying the chlorine, was also suggested to me by the same distinguished horticulturist. In this way, he says, he has made tropical seeds vegetate, which refused to germinate by other modes of treatment. He placed the mixed ingredients mentioned above, in a glass retort, inserting its bulb in the hot-bed, and bringing its beak under the pot in which the seeds were sown, connecting it with the drawing aperture of the pot. The chlorine gas is gradually evolved, passing through the earth of the pot to the seeds, accordingly as the heat required for the different species induces.

Achard and others have proved that seeds will not germinate in any gas, without a mixture of oxygen.

If kept perfectly dry, seeds will never vegetate: they require therefore some kind of moisture, and that moisture must be supplied by *water*. I have kept beans and peas moistened by olive oil and alcohol only, but otherwise under circumstances favourable to vegetation, without their shewing the least symptom of germinating. Water, then, is an essential; the most appropriate quantity varies with the species of plant. If in excess, it is more prejudicial than a total deficiency, since in the first case it excites decay, in the latter event, the seed remains unaltered. That the first ever occurs in practice, arises from the faulty cultivation of the soil; for if properly drained, however retentive it may be, no natural deposition of moisture is ever too abundant or continuous. Some seeds, as those of aquatics, succeed only when completely immersed in water; others, as those of the lemon, will often germinate with the unassisted moisture of their own pericarp.

All seeds require a certain degree of *heat*; none will germinate at a temperatuse so low as that of freezing water, yet the greatest degree of cold is not injurious to them, if germination has not commenced. Every seed appears to vary in the degree of heat which it requires before vegetation commences, though an increase above such temperature, if not excessive, always accelerates the progress. Adanson found that seeds which natnrally do not germinate in a less space of time than twelve hours, may, by an increase of heat, be made to do so in three hours. Seeds ripened in high latitudes, or at great heights, and consequently in a climate whose average temperature is much lower than that of countries nearer the equator, or of less elevation above the sea, germinate much more quickly when sown in these latter climates, then if re-sown where they were produced; a fact which defies explanation, if plants are devoid of sensation.

The experiments of Ingenhouze and Sennebier evince that light retards germination; and some which were tried under my own inspection, afforded confirmatory results. This fact has long been practically acknowleged by the cultivators of the soil burying their seed beneath its surface.

These facts hold out some beacons worthy of being attended to, as guides for the operation of sowing. They point out that every kind of seed has a particular depth below the surface, at which it germinates most vigorously, as securing to it the most appropriate degree of moisture, of oxygen gas, and of warmth. From a quarter of an inch to two inches beneath the surface, appears to be the limits for seeds of plants usually the objects of cultivation; these however must vary for the same seeds, in different grounds and countries. It must be the least in aluminous soils, and dry climates. Sowing should in general be performed in dry weather, especially on heavy soils, not only because of the greater saving of labour, but because it prevents the seed being enveloped with a coat of earth impenetrable by the air, "which" says Sir H. Davey, "is one cause of the unproductiveness of cold clayey soils." Perhaps the time at which any ground may be raked with the greatest facility, is as good a practical criterion as any, to judge when it is most fit for sowing. In general, if clay does not predominate in its constitution, a soil rakes best just after it has been turned up. If clay does predominate, it usually rakes with more facility after it has been turned up two or three days, and then immediately after a gentle rain. But it is certain, that the sooner seed is

sown after the soil is dug for its reception, the earlier it germinates. In the droughts of summer, water is often required to newly-sown beds. Such application must not be very limited or transitory; for if the soil is only moistened at the immediate time of sowing, it induces the projection of the radicle, which, in very parching weather, and in clayey caking soil, I have known wither away, and the crop be consequently lost from the want of a continued supply of moisture.

From the slight sketch already given, it will have been seen that plants derive their whole nourishment from the air and soil. It is of importance to know how the constituents of these may be ascertained, so as to enable us to judge before hand, whether they hold out a prospect of affording a plentiful increase to the cultivator.

Experiments on the constituents of atmospheric air, are never required by the tiller of the ground; for it has been demonstrated by the best chemists that its composition is invariably the same in all parts of the globe, and whether obtained from a level with the sea, or from the greatest height to which man has found means to ascend. Their researches afford one general result, which is, that the atmosphere is composed of twenty-one parts oxygen and seventy-nine parts nitrogen, with the admixture of about one part of carbonic acid gas in every 1000 of its parts.

This simplicity of composition is very far from existing in soils; of them, perhaps, no two specimens in the world are precisely alike.

I shall now proceed to detail the mode of analysing a soil which I employ, and for which mode I was originally indebted to the *Elements of Experimental Chemistry*, by Dr. Henry.

ANALYSIS OF SOILS.

Two hundred grains are as eligible a quantity of any soil to analyse as can be selected. Previously to analysis, a proportion should have been kept, slightly covered, in the dry atmosphere of a room for several days, to allow it to part with all the moisture that can be obtained from it by mere atmospheric exposure. Two hundred grains of the soil thus dried should then be placed on a small plate, and held, by means of a pair of pincers, over the flame of a candle or lamp, with a small shaving of deal upon it, until this shaving begins to scorch. The process is then to cease, and the loss of weight, sustained by the soil being thus dried, ascertained. We will suppose it amounts to 30½ grains. The residue must then be gently triturated in a mortar, which, properly, should be of agate, and sifted through a piece of fine muslin; what remains in the muslin will consist of stones and vegetable fibres; the weight of these must be ascertained, and this we will suppose amounts to 15½ and five grains respectively. The stones must here be examined by dropping some sulphuric acid (oil of vitriol) upon them; if they effervesce, they contain chalk; if not, they are siliceous, will be sufficiently hard to scratch glass, and will feel gritty; or they are clay stones, will feel soft, and be with little difficulty cut with a knife. That part which passed through the muslin must now be boiled in a small tea-cup full of clean water, for about five minutes; being allowed to cool, and a piece of clean blotting-paper, previously dried before the fire and its weight ascertained, employed to strain the liquor through, care must be taken to get every particle of the soil into the strainer from the vessel in which it was boiled, by repeated washings with clean water. When the liquor is all strained away, place the blotting-paper on a plate over the candle with a shaving of deal on the plate and dry it until the shaving begins to scorch. When

perfectly dry weigh the whole; and then the weight of the paper being subtracted, the weight of the residue, and, consequently, the quantity of matter dissolved in the water, will be afforded; this, which consists of salts and vegetable extract we will suppose, amounts to 4½ grains. The watery solution must be carefully set on one side, and the analysis of the solid parts proceeded with. Half an ounce, by measure, of muriatic acid (spirit of salt) must be poured upon this in a saucer, and allowed to remain for full an hour, being occasionally stirred with a piece of glass or porcelain; this must now be strained by means of a piece of blotting-paper as before, the matter left upon it being frequently washed with clean water, and the washings allowed to pass through the paper to mingle with the other acid liquor; the matter left upon the paper being perfectly dried and weighed, and the loss ascertained, we will suppose this to be 20 grains. Into the liquor must be dropped, gradually, a solution of prussiate of iron. The blue precipitate which this will occasion, being collected by filtering through paper and washed as before, heated red hot by means of an iron spoon in the fire, and then weighed, we will suppose it to weigh 2½ grains; this is oxide of iron. This, deducted from the 20 previously ascertained to be in the solution, leaves 17½ grains, which may be considered as carbonate of lime (chalk), though probably with the admixture of a little carbonate of magnesia. The solid matter must now be heated to redness in a spoon, until upon cooling it does not appear at all black, this must then be weighed, and the loss noted; that loss consisted of animal and vegetable matters, we will suppose it amounted to 7 grains. The remainder must be boiled for about two hours with 2 drachms, by measure, of sulphuric acid, mixed with 8 drachms of water, and, when cooled, strained through blotting-paper, as before and washed; when dried at a red heat in the spoon, the loss sustained will be alumina (clay); what remains will be silica (flint). We will suppose the first to weigh 15 grains, and the latter 102½ grains. The analysis will stand thus: -

Water	30·5
Stones and coarse sand	15·5
Vegetable fibres	8·
Saline matters	4·5
Oxide of iron	2·5
Carbonate of lime	17·5
Decomposing matter destructible by heat	7·
Alumina	15·
Silica	102·5
	200·

The first watery lixiviation, employed to obtain the saline matter, may now be evaporated to dryness; if of a brown colour, it is chiefly vegetable extract; if of a whitish colour, it is principally saline, and probably consists of chloride of sodium (common salt), with the admixture of a little sulphate of lime (gypsum).

The above mode of analysis I have made as simple as possible, and it requires no other apparatus than a set of grain scales and weights, a little sulphuric and muriatic acids, and some prussiate of potash, the whole of which, sufficient for examining every soil upon a large estate, may be obtained for thirty shillings.

In the above are no processes requiring adroitness in the manipulation, extreme nicety in the operation, or the practiced eye of science and experience to conduct. All is simple, requiring nothing but the employment

of the ordinary carefulness and the common sense of the experimenters. —The proportion of soil which it is proposed to analyse, should be taken at about three inches from the surface. Neither should the surface-soil only be examined, but the substratum also. For it often will occur that the subsoil is of a better staple than that which reposes on it; or is of a quality that is capable of correcting some deficiency in it. Thus a light siliceous soil will often lie upon a stratum abounding in alumina, which, by digging or trenching, may be brought to the surface and mingled with it.

The foregoing plan of analysis, it must be observed, is not one so particular as a practised chemist would pursue; but it is one easy, and capable of affording all the facts usually required to be known by a cultivator: viz. the moisture—retaining power of a soil; the quantity of soluble and decomposable matter it contains; and the proportions of its earthy constituents.

It has been urged by some, that a great deal of information may be compendiously obtained, by ascertaining the specific gravity of a soil; but of this I could never feel convicted. That a peat soil, that is, one containing a great excess of vegetable matter, is much lighter in weight than such as contain more of earthy constituents, is certain; but such do not require their specific gravity to be taken, to detect them. If a soil is but rather under or above the average specific gravity, I do not see how the knowledge of that can determine whether excess of weight arises from silica, or carbonate of lime; or the deficiency of weight from vegetable matters, alumina, or other light constituents. The specific gravity of silica, is 2.66; of carbonate of lime, 2.7; of alumina only 2. The unproductiveness of a soil, usually arises from the excess of some one of the usual constituents which are enumerated in the foregoing imaginary analysis, rather than from the admixture of any foreign substance prejudicial to vegetation. I have given the constituents of a fertile soil in detail, and to what I have already stated, I have little to add. I have also stated, that a soil too retentive of moisture is seldom met with, that cannot be rectified by the mechanical remedy of underdraining. If it is purposed to ameliorate a soil which contains too much alumina, by a surface application, much judgment is necessary. The most obvious application is sand, either from the sea shore or drift, road-scrapings, coal-ashes, &c.: but if these are not applied largely, the soil is rendered even worse and more difficult of cultivation; for I have seen such soils, which have had a slight dressing of siliceous matters as above enumerated, rendered thereby so approaching in constitution to brick earth, that in dry weather they have become so hard as to defy any power but that of a volcano, to break them up. A soil is not rendered sterile by an excess of alumina, unless it contains nearly fifty per cent. of it; and, to such, nothing less than forty tons of sand per acre, would be of unalloyed benefit.

If a soil is unproductive from containing too much silica, the obvious application to improve its staple, is clay and chalk. Four hundred parts of soil of Bagshot Heath, contain three hundred and eighty parts of siliceous sand. It is completely barren. Yet Sir Humphry Davy, who made this analysis, found that a good turnip soil in Norfolk, contained eight parts out of nine siliceous sand. Such light soils, however, are more manageable, for they are always capable of tillage; and the cultivator can render them more absorbent and retentive of moisture, by means of vegetable manures, chalk, &c. Such soils are termed hungry, for the yard manure applied to them is soon exhausted, and for this reason, that its mucilaginous and unctious constituents will not combine, with even a slight degree of affinity, with silica, which they will with alumina and chalk. At the same time, light soils admit rain into their texture, to carry away their fertile constituents in the drainage waters; and the same openness of texture likewise admits the free access of air to hasten the putrefaction of the vegetable matters they contain, as well as the easy escape of the gases which are evolved, and all which, we have before shown, are equally beneficial to plants. Silica may abound to a much greater extent in a soil than any other of its usual constituents, without being unfavourable to vegetation. Chalk should never be present in a soil to a greater extent than six or eight per cent.; decomposable, animal, and vegetable matter, to no more then ten per cent: nor can the saline constituents soluble in water, oxide of iron, &c., amount to more than six per cent, without injury proportionate to the excess.

Foreign impregnations, causing a soil to be sterile, or impairing its productiveness are rare. Acids have been ranked among the causes of sterility; but a soil containing any in a free state, never came under my notice, or under that of any other practical chemist of whom I have ever read, or with whom I have ever conversed. Some soils or certain portions of a field not generally so affected, will be found to produce sorrel and other plants abounding in acids; and, as when chalk, or any other neutralizer of acids is applied to such spots they cease to produce sour plants, it has been deemed a legitimate conclusion that those plants obtained their acids from the soil, which being removed or neutralized by the chalk, consequently destroyed the plants by depriving them of one of their chief constituents. To say the least of it, such an opinion betrays a very great ignorance of physiology and vegetable chemistry. In the first place, the food obtained by all plants from the soil, is perfectly insipid

when absorbed, and whilst rising through the vessels in the woods; and no secretion, acid, or otherwise, is ever found with it until it has been elaborated in the leaves. It is only to be detected in them, and more manifestly in the bark. The fact seems to be, that plants abounding in acids generally frequent a wet soil, and such soil is rendered less retentive of moisture by chalk. Again, the contact of chalk with plants containing acids, causes decomposition in them, ulcers, and if perpetually presented, death. Lastly, such sour soils, as they are termed, are usually as effectually cleared of acid plants by mixing them with other substances that will render them porous, and by underdraining them thoroughly, as they are by mixing chalk with them. I never heard of more than one soil containing an uncombined acid, and that is in the island of Java, near Batavia. There is a small stream there, which contains free sulphuric acid (oil of vitriol); its banks being impregnated by it are, of course, barren. This stream flows into another, which passing rapidly through a tenacious soil, is turbid from the mixture of alumi ous particles with its waters. No sooner does the acidulated stream mingle with them, than they become clear; for the acid combining with the clayey particles, forms sulphate of alumina, which is a perfectly soluble salt.

I shall now proceed to consider some of the diseases of plants whose ravages affect the horticulturist, and on which science may afford some light.

Plants being organised bodies whose parts in the common course of nature are subject to waste and decay, the functions of these are consequently liable to disarrangement, and such disarrangement constitutes disease. Such morbid affections are not, however, always the consequences of old age: they are often caused by matters being absorbed from the soil which are inimical to the constitution of the plant; from a want of those that are beneficial, as well as from their excess; from violent and sudden transitions of temperature; from wounds, and from the attacks of vermin. "Animals," said the late Dr. Good, "are liable, as we all know, to a great variety of diseases; so, too, are vegetables, to diseases as varied, and as fatal; to diseases epidemic, endemic, sporadic; to scabies, pernio, ulcer, gangrene; to polysarcia, atrophy, and invermination. Whatever, in fine, be the system of nosology to which we are attached, it is impossible for us to put our hand upon any one class or order of diseases which they describe, without putting our hand at the same time upon some disease to which plants are subject in common with animals."

To write generally on the prevention or cure of diseases in plants would be useless, since the trite observation—"Every thing that tends to the health of vegetables should be adopted," is the summary of the whole. We have already enumerated the contingencies that are prejudicial, and as the particular diseases are considered, these will be more fully insisted on.

Canker, Ulcer.—These are synonyms of the same disease, which is accompanied with different symptoms, according to the species of tree in which it occurs; being known as canker in those whose true sap contains a more than usual proportion of acid, and as ulcer in those containing tannin, or other astringent principles. In both it is an ulcerous affection.

The symtoms vary in the genus Pyrus, and others whose sap contains a free acid. It is seldom, if ever, accompanied by a discharge; but the parts affected enlarge, their wood becomes brown and carious, and the bark covering them cracks, gapes, and manifests a disposition to separate from the wood. In the genera Ulmus, Quercus, and others abounding in astringent matters, a copious discharge usually accompanies all the preceding symptoms, which are always present also, with the exception of the swelling of the parts, which only occasionally occurs. The discharged liquid is occasionally transparent, but generally a reddish brown, becoming nearly black by exposure to the air. The sides of the ulcer, in the first instance, are usually covered with a white crystalline incrustation; in the second with a shining varnish-like coat. In the genus Prunus, and

others abounding with gum, the same symptoms are exhibited, except that swelling still more rarely occurs, and that the discharged matter is nearly pure gum, a variation which seems to remove it to another class of diseases. In every instance, I am prepared to maintain that the disease is local; that is, it arises from the disarrangement in the functions of the affected part, and is never brought on from a general diseased state of the tree, but is occasioned by contingencies perfectly independent of soil and situation. When the disease has commenced, if these are unfavourable, they may aggravate the symptoms and promote their diffusion, but they are not the originators of the disease.

It appears to me in general to arise from contused wounds, however they may be inflicted; by the bruise occasioned by a blow, or the erosion by a ladder, or the contact of two branches. The wounds in such cases, as in the animal frame, are long in healing; the extravasated sap and contused vessels, speedily decompose, and how this spreads by contact, in all organised bodies, is too well known to need to be here insisted upon. The complete removal of the affected part by the knife, and then covering the wound by a plaster to exclude the air, is the best remedy; and if, from long neglect, it has been allowed to spread itself from branch to branch, until the whole tree has become infected, remedies then are of no avail, and the tree had better be removed.

The chemical phenomena of the disease appear to be the complete decomposition of the vegetable fibre, which passes off in the form of carbonic acid, and carburetted hydrogen gases, whilst the friable matter which remains behind, consists of some foreign vegetable principle, the result of decomposition and an excess of saline and alkaline matters.

Vauquelin analysed the sanious discharge from an elm, and found in it nearly 40 per cent. of alkaline and saline constituents, which is about three times as much as the sap contains when in an healthy state, if compared with the amount of its vegetable constituents. Then again, the saline matter in the sap of the elm consists chiefly of acetate of potash and carbonate of lime: those in the sanious discharge, of carbonate of potash and carbonate of lime. Decomposition has here, therefore, been effected, as well as in the carbonaceous matter of the tree: a decomposition too, aggravating the disease; for woody matter, macerated for some time in a solution of carbonate of potash, is decomposed and converted into ulmin: and that this effect is produced in the progress of the disease, was demonstrated by Vauquelin, who found that the brown matter discharged by the elm consisted of ulmin and carbonate of potash.

Sir Humphry Davy detected carbonate of lime on the edges of the cankered parts of apple trees. The above facts demonstrate that an excess of alkaline matters occurs in vegetable ulcerations; and, guided by this, the last named chemist recommended diluted acids to be applied to the wounds, and even poured about the roots in case the tree is of sufficient value. The topical application would doubtless check the corrosion of the ulcer; but it admits of doubt whether the administering an acid to the roots would be of benefit unless it were one that is not with facility decomposed, as the sulphuric or muriatic: for, previously to arriving at the wound, it would have to be elaborated in organs which no vegetable acid, as the acetic or tartaric, would pass through unchanged. Muriatic acid I should recommend to be employed; for even if decomposed, the results would be compounds that may be applied to ulcerous affections with advantage. To the wound it should be applied after being mixed with

twice its bulk of water; and to the roots after an ounce has been mixed with a gallon of water, applied twice a week.

It must not be neglected to be observed, that if old trees become affected with this disease, there is little chance of preserving them; for the sap of old trees always contains less of vegetable and more of saline matter than when they are young and vigorous, consequently they are more prone to the disease.

"The old age of a tree," says Davy, "in this respect is faintly analogous to the old age of animals, in which the secretions of bony matter are always in excess, and the tendency to ossification great."

It is a very mistaken idea of some gardeners, that trees affected with canker are benefitted by having the earth removed from around their roots, and the space refilled with sand: on the contrary, if the old soil is removed, it should be replaced by that which is fresh and fertile; at all events, a little well putrefied dung should be pointed in round the stem, and the surface kept covered with mulch during the summer, to prevent their being injured by drought. In short every thing should be done to keep them in vigour.

Club-root.—This disease, which appears to be confined to the Brassica tribe, is one that is often and extensively prevalent. It is the most injurious to which they are subject, since it attacks them in the earlier stages of their growth, and by nearly or entirely destroying the root, allows them to drag on a stunted and unproductive existence, or at once destroys them.

A principal predisposing cause of this disease, is growing Brassicas during succeeding years upon the same ground. Yet it is not because by this means the soil is impoverished, for the disease occurs equally whether the soil is manured or otherwise; and again, it occasionally occurs on land that has not borne a Brassica for years. The seasons, according to my observations, have some influence, though in 1819, which was an exceedingly hot and dry year, this disease did not appear to a much greater extent that I could ascertain, than in 1821, which was wet and cold. With regard to soil;—light siliceous ones appear to be most infested with this disease;—such are most favourable to the disposition and incubation of the insect ova. I believe plants put into the ground in the spring, are not liable to suffer by this disease.

The first symptoms of infection are the leaves appearing more flaccid, and of a lighter hue, than those of unaffected plants, and the entire individual appears stunted. If the root in the earliest stage is examined it will be found knobbed; a small brown perforation in the centre of the protuberance, containing a small white maggot, often makes its appearance: after the lapse of a week or two, the tumour becomes brown and cellular, and over-run with small white insects; finally, the whole becomes decayed and the plant is destroyed. From these facts it appears to me, that the disease proceeds from a disposition which there is in every species of the Brassica tribe to produce a bulbous root, which is promoted by the absence of moisture, and some constituent of the soil which conduces to the vigour and luxuriance of the superior parts. The bulbous malformation forms an eligible situation for the insect to deposit its egg, and the subsequent ravages of the maggot are sufficiently explanatory of the causes of the appearance which the disease afterwards puts on. If the plants in the seed-bed are affected, by removing the bulbous swelling and planting in a fresh fertile soil they will generally recover, if properly supplied with

water. Salt has been applied by several persons as a preventive of this disease with considerable success. It should be applied before sowing to the seed-bed, as well as before planting. From twenty to forty bushels per acre is not too much.

Mr. Ronalds, of Brentford, considers soap ashes dug into the soil a good preventive. As also if the roots of the plants, previous to insertion are well steeped in a puddle of the same with water.—(*Trans. Hort. Soc. Lond.* v. 3. p. 168.)

The Anberry or Hanberry is a species of Club-root to which the turnip is subject. The excressence, which appears to arise from a similar cause, follows similar grades of increase and decay. It makes its appearance below the bulb, and often arrives to a diameter of six inches. In Norfolk they consider marl as a preventive of this disease; thence, it would appear, attributing it to the lightness of the soil.

Mildew.—This name is given to that hoary glutinous matter which often makes its appearance on the leaves of the Brassica and pea crops at the close of summer and during autumn, especially if dry weather occurs. It would seem to be an exudation from the plants which obstructs the respiratory organs, and injures their vigour. This, perhaps, arises from the excessive transpiration at these seasons, and which is not compensated by any additional moisture at the root; and the increased portion of moisture that abounds in the atmosphere at these seasons, in the opinion of Mr. Knight, aggravates the evil. "Experiments," he states in a letter to the late Sir J. Banks, "which I have annually been in the habit of making on peas, leave no room to doubt in my mind, that want of moisture at the root and excess of it on the leaves and stems, is one at least among the secondary causes of mildew in that plant." To prevent this, he recommends green vegetable matter to be turned into the trench, which should be shallow, and watered with a weak solution of salt. By being shallow the roots spread near the surface, and reap as much benefit as may be from the slight atmospheric depositions of the season. Added to this, the rows must be frequently watered, especially if the weather is at all dry. All other plants subject to the disease, I have observed to escape if plentifully supplied with moisture to the root.

Curl.—This is the name of a disease incidental to the potatoe, and to me seems the concomitant of its old age; the leaves become excessively twisted and wrinkled, remain dwarfs of a dark hue, and the plants are entirely unproductive. The following have all been advanced as the causes of it, viz. frost—insects—planting from sets of unripe and large potatoes, or in exhausted ground—forcing the sets with too much fresh dung—planting and earthing too deep on a south aspect—taking sets from bulbs that have been frosted or heated in the heaps—planting too near the surface—unfavourable soils and seasons—planting the same variety and raising the stock for several years on the same soil—breaking off the shoots of the sets—the sets being exposed for a week or more before planting. The cause to which the disease has been attributed by the Hon. Baron Hepburn, of Smeaton, N.B., and which is supported by very extensive and long-continued experiments by Mr. Dickson, Secretary of the Caledonian Horticultural Society, as well as by some of President Knight's, Mr. Crozer's, &c. appears most worthy of attention. They consider that the tubers from which the sets are cut are usually allowed to become too ripe. This new theory, which is diametrically opposed to one stated in the foregoing list, is observed by Mr. Dickson to be almost

uniformly objected to, as quite contrary to experience as regards seeds in general; but the sets of potatoes partake little, strictly, of the nature of seeds, and it should be remembered that the slips of roots in general are taken from the youngest portions. Those plants intended for stocks should be planted a fortnight later than those for domestic use, and be taken up as soon as their stems become of a yellow-green hue, at which period the outer skin may be easily rubbed off between the finger and thumb.—(*Mem. Caled. Hort. Soc.* v. 1, p. 50—9. *Trans. Hort. Soc. Lond.* v. 1 p. 125.)

The long dun-coloured, old winter red, ox noble, and champion varieties, are generally agreed to be less liable to suffer from this disease than any other.

To prevent the occurrence of this disease, the causes of it before enumerated should as much as possible be avoided. The sets should be of moderate size, from imperfectly-ripened potatoes of an average sized growth, which have been kept dry and well preserved; care should be taken not to rub off the shoots, or to plant them too deep. Sets obtained from curled plants are sure to propagate with them the infection.—(*Mem. Caled. Hort. Soc.* v. 1. p. 438.)

A variety of potatoe will not continue in its prime more than fourteen or fifteen years; and as every plant, as it approaches the limit of its existence becomes more subject to, and affected by disease; the raising of fresh varieties is one obvious mode of preventing its occurrence.—(*Mem. Caled. Hort. Soc.* v. 1, p. 61.)

Smut and Mildew in Wheat and other species of Corn.—I had prepared a very full treatise upon this interesting subject, but it has been unfortunately destroyed, and I cannot now replace it. It must suffice for me to say, that continued observation and long consideration of the subject, have made me conclude, that the seeds of the fungi, which constitute these diseases, are absorbed by the plants from the soil with the moisture they imbibe by their roots. That those fungi, which are of the species uredo, can exist upon dry soil, or even paper, and not only exist, but produce seed, has long since been proved; and that they are communicated from the soil to the plant, is most in accordance with all the phenomena and facts known relating to the disease.

I have thus slightly touched upon some of the diseases of plants upon which Chemistry and Botany throw light: to go through them in detail would require long attention and continued observation; it may form the occupation of a future period, at present it is out of my power. Should any one succeed me, I most sincerely wish him success in the treatment of this very interesting and difficult subject.

CHERRY.

Cherry (*Prúnus Cerásus*), Icosándria Monogy'nia, Linn.; and Rosáceæ, Juss.

The cherry, as an agreeable summer fruit, is pretty generally cultivated throughout the kingdom. The varieties are very numerous. The Horticultural Society's catalogue embraces two hundred and forty-six; but the following list is recommended by Mawe as containing the best varieties for general cultivation, the whole being arranged in the order in which they ripen:—

June.
1. Small May.
2. May Duke.
3. Early Black.
4. Late Duke.

July.
5. Archduke.
6. Ronald's Black-heart.
7. White Tartarian.
8. Black Eagle.
9. Kentish.
10. Bigarreau.
11. Holman's Duke.
12. Elton.
13. Herefordshire Heart.
14. Bleeding Heart.
15. Carnation.
16. Waterloo.

August.
17. Harrison's Heart.
18. Black Heart.
19. Graffion.
20. Coroun.
21. Luke Ward.
22. Black Geen.
23. Small Black Wild.
24. Small Red Wild.
25. White Swiss.
26. Lundie Geen.
27. Transparent Geen
28. Cluster.
29. Yellow Spanish.

September.
30. Florence.
31. Amber Heart.
32. Flemish Heart.
33. Red Heart.
34. White Heart.

October.
35. Morello or Milan.

Estimate of Sorts.—For small gardens, either as wall trees, espaliers, or standards, the following varieties are recommended:—The Mayduke, Morello, Archduke, Black Heart, White Heart, Graffion, Harrison's Heart, and Kentish Cherries. Miller considers the Common Red or Kentish, the Duke, and the Luke Ward, as the best trees for an orchard: they are plentiful bearers.

Culture, &c.

SOIL.

The cherry prefers a light dry sandy loam, with a free exposure.

PROPAGATED.

1. By budding or grafting upon stocks of their own kind, raised from stones of the fruit, which are sown in the autumn, in light sandy earth, or preserved in sand till the spring following, and then sown. The young trees will come up the same year, and in the second autumn may be transplanted into nursery rows, at one foot distance from each other. In the succeeding summer they may be budded, if intended for dwarfs; but if designed for standards, they should remain till they are four years old, and then be grafted or budded at six feet from the ground. The best stocks for general purposes are supposed to be raised from the wild black or red cherry, because they produce trees of longer duration than stocks do which are raised from stones of cultivated fruit. The *morello* is grafted upon with a view to obtain dwarf trees; but the *mahaleb*, or perfumed cherry, is said to furnish the best dwarf stock. Mr. Knight observes that "the cherry sports more extensively in variety, when propagated from seeds, than any other fruit which I have hitherto subjected to experiment; and this species of fruit is therefore probably capable of acquiring a higher state of perfection than it has ever yet attained. New varieties are also much wanted; for the trees of the best old kinds are every where in a state of decay in the cherry orchards; and I am quite confident, that neither healthy nor productive trees will ever be obtained from grafts or buds of the old and expended varieties of this, or of any other species of fruit trees."

2. *Final Planting.*—Plant full standards from twenty to thirty feet apart; small standards fifteen, eighteen, or twenty feet. The proper season for planting is from the middle or end of October, or any time in November or December; if open weather, till February or March. Miller says, "never plant standard or rider cherry trees over other fruits: for there is no sort of fruit that will prosper well under the drip of

cherries." He allows forty feet square for standards in orchards for the same reason.

3. *Pruning.*—Cherry trees in general produce the fruit upon small spurs or studs, from half an inch to two inches in length, which proceed from the sides and ends of the two-year, three-year, and older branches; and as new spurs continue shooting from the extreme parts, it is a maxim in pruning both standard and wall trees, not to shorten the bearing branches where there is room for their regular extension. The morello is in some degree an exception. In the pruning of *standards* give only occasional pruning, to reform or remove any casual irregularity from cross-placed or very crowded branches; and take away all cankery and decayed wood. *Wall trees*, according to Abercrombie, require both a summer and winter pruning. A summer pruning, to commence in May or June, is necessary to regulate the shoots of the same year. Disbud the superfluous and foreright shoots; or if they have been suffered to spring, pinch or cut them off, with such as are disorderly. Retain a competent supply of some of the best well-placed side and terminal shoots, to remain for selection at the winter pruning. Nail or lay in the reserve close to the wall at their full length, and so train them all summer. The *winter pruning* may be performed at the fall of the leaf, or at any time in moderate weather, till February or March. It comprises a regulation both of old and young wood. Carefully preserve the sound productive branches and bearers in their full expansion; and reduce or remove such only as are irregular in growth, too crowded, unfruitful, decayed, or cankery. Any branches extending out of bounds, prune into some good lateral shoot or fruit-bud. According to the time the bearers have already lasted, look to some promising shoots for successors to those which may first wear out. To fill immediate vacancies, retain select shoots of last year and the year before, with uniformly a leader to the advancing branch where there is room, and with lateral shoots in any open or unproductive space nearer the origin of the branch, to be trained as bearers between the main branches. Some cut superfluous fruit-shoots clean away; others leave a sprinkling of short stubs, cut very short if foreright. The new laterals and terminals are to be trained in at full length, as far as room will permit. They will come into bearing the first and second year. In pruning cherry trees in general, be careful to preserve the small clustering fruit spurs, except where in wall-trees any old spurs project considerably, and assume a rugged disorderly appearance; cut *such* clean out smoothly.

Pruning the Morello.—The morello cherry bears principally on the shoots of last year, the fruit proceeding immediately from the eyes of the shoots; and bears but casually, and in a small degree, on close spurs formed on the two-year-old wood, and scarcely ever on wood of the third year. Therefore both in summer and winter pruning, leave a supply of last year's shoots on all the branches, from the origin to the extremity of the tree, for next year's bearers; cutting out past bearers to make room. It is plain that the morello ought to have no stubs left with a view to spurs, and all foreright shoots ought to be disbudded while young. To leave a convenient space for young wood, train the present bearers six inches apart; lay in between each of these one young shoot for bearing next year, which will make the promiscuous distance three inches. In fact, the pruning of the morello is in every respect similar to that of the peach.

4. *Insects.*—Wall cherry trees are sometimes covered, particularly the extremities of the young midsummer shoots, with multitudes of a species of black fly or beetle; for their destruction, Naismith recommends a fumigation composed of pitch and orpiment (sulphuret of arsenic), in the proportion of fifteen parts of the former to one of the latter. These are to be melted together in a pipkin; and when cold, the mass is to be divided into pieces about the size of a hen's egg, and burned by means of damp straw, under the infested trees. In an hour's time after fumigating, the trees are to be washed with a garden engine, provided the state of the fruit will admit of the operation.

USE.

Principally for the dessert, and occasionally for pies, tarts, and confectionary. Morello cherries steeped in brandy qualifies and improves its strength and flavour, hence called cherry brandy.

CHESNUT.

Chesnuts are of two kinds:—

1. The Common or Sweet Chesnut, *Castánea Vésca*), Monœ'cia Polyándria Linn.; and Amentáceæ, Juss.
2. The Horse Chesnut (*Æ'sculus Hippocástanum*), Heptándria Monogy'nia, Linn.; and Hippocastáneæ, Juss.

Of the Common or Sweet Chesnut there are two species cultivated:

1. The Spanish Chesnut (*Castanea Vesca).*
2. The American Chesnut *(Castanea Americana).*

Culture, &c. of the Common or Sweet Chesnut.

SOIL.

It not only thrives in any soil in which the oak is grown in perfection, but also attains a considerable size in soils of a poorer nature. Wet strong soils are however best suited for this tree, when the object in view is to obtain fine timber trees.

PROPAGATED.

1. *By seed,* which ripen in England in October, in fine seasons, but seldom if ever in Scotland. Nurserymen are supplied with home-saved seeds in good seasons, but in unfavourable ones from Spain, where this fruit is yearly ripened and imported from thence into this country. Chesnuts imported are by far the best for sowing as well as for eating. They should be sown as soon as gathered or imported, in seed beds or in drills, and covered to the depth of two or three inches. Mice and rats are very fond of this seed, and if once they find them in the ground it is no easy matter to keep them off; attention should therefore be paid to guard them against such enemies. When the young plants appear in spring, and during the time they remain in the seed-beds, they should be kept clear of weeds; and the spring subsequent to the sowing they should be taken up, sized, and transplanted into nursery lines, twelve or fifteen inches distant, and five or six inches apart in the line. The season following they will require to be taken up and transplanted at greater distances, to afford them space to attain a proper size for final planting out. Chesnuts may be planted out when three years old, or they may remain in the nursery till they are five or six years old, and then may be planted out with success.

USE.

1. The timber of this tree is truly valuable, and will stand in situations exposed to wet and dry, when divested of its sap-wood, longer than oak; and for gate posts, ranks in durability next after the *acacia*, yew, and probably also longer than the larch.

2. Phillips, in his History of Fruits, informs us that the chesnut-wood has been recently successfully applied to the purposes of dying and tanning, thus forming a substitute for logwood and oak bark. The leather tanned by it is declared by the gentleman who made the experiment, to be superior to that tanned with oak bark; and in dying its affinity for wool is said, on the same authority, to be greater than that of either galls or sumach, and, consequently, the colour given is more permanent.

3. The wood might be profitably employed in the making of wine casks, it being less liable to shrink or to communicate any disagreeable flavour to the contents.

4. The English nuts are well tasted, but do not reach in size those brought from Spain. In England they are eaten either raw or roasted, but in Spain they are boiled. They appear at our desserts as an article of luxury from October to April.

Culture, &c. of the Horse Chesnut.

PROPAGATED.

By seed, which is collected in the fall of the year, when the outside shell opens and lets it out. The seed is preserved and sown in the same manner (only covered a little deeper), and the plants are to be treated, in all their stages, in the same manner as the Spanish or sweet chesnut.

USE.

Chiefly as an ornamental tree.

CHIVES.

Chives (*A'llium Schœnoprásum*), Hexándria Monogy'nia, Linn.; and Asphodéléæ, Juss.

This is a hardy perennial plant; a small kind of onion, growing in close tufty bunches, with small bulbous roots.

Culture, &c.

SOIL.

Will grow in almost any soil or situation.

PROPAGATED.

By dividing the roots in the spring or autumn; if in spring, the months of February, March, or April, are to be preferred. They may be planted in beds or borders, from eight to twelve inches asunder, and they will soon form large bunches.

USE.

1. The tender leaves for salads in the spring, and occasionally for soups, &c. Being much milder than the onion, they are preferred by many for the above purposes.

2. Sometimes the leaves and roots are taken together, being slipped to the bottom singly, and then brought to table as a substitute for young onions.

CLOVER.

Clover (*Trifólium*), Diadélphia Decándria, Linn.; and Leguminósæ, Juss.

The clovers constitute a numerous class of plants, but those generally employed by agriculturists are all indigenous to this country, and are four in number.

1. Common Red Clover, (*Trifolium pratense*).
2. Cow-grass, Meadow Clover, or Marl-grass, (*Trifolium medium*).
3. White or Dutch Clover, (*Trifolium repens*).
4. Yellow Clover, Hop-trefoil, or Shamrock Clover, (*Trifolium procumbens*).

Of the above species, the common red clover and the Dutch clover are by far the most extensively employed by farmers; the former for mowing and soiling, and the latter for pasturage.

Culture, &c. of the Red Clover.

SOIL.

The best crops of clover are undoubtedly grown in rich calcareous soils where the surface mould is deep; it succeeds also excellently on deep rich loams, which are well adapted for the growth of its long tap roots.

PROPAGATED.

1. *By seeds,* which are almost always sown broad-cast, either in the spring from February to May, *with other grain,* or by themselves in the autumn, from August to October.

2. The quantity of seed must, of course, vary according to the nature of the soil and the intention of the cultivator. If sown by itself about fourteen pounds of seed per acre will be required. If intended for *hay,* then it will be best to sow about eleven pounds of clover, six pounds of trefoil, and about eight pounds of rye grass, for a similar quantity of land.

3. In preparing the land, it is recommended to manure on the grass seeds in winter with good well-rotted manure, to which a quantity of lime or gypsum should be added if the soil is deficient in calcareous matter; for so congenial is calcareous matter to clover, that the mere strewing of lime over some soils will call into action clover seeds, which it would appear have laid dormant for ages; this, therefore, is a point well worthy the consideration of the farmer; for if his soil is poor, light, and sandy, dung alone will not be sufficient to procure him so productive a crop as lime and dung together. Gypsum or sulphate of lime, where it can be procured, affords the most eligible manure, as the ashes obtained

from the plant after burning have been found to contain this substance in a very large proportion. Soot, marl, and, wood ashes, are also useful applications. Land prepared as directed, will average at least one ton per acre more than when no manure has been applied.

4. After sowing the seed in spring it will be necessary first to harrow and then to roll it in.

5. The after culture chiefly consists in picking off any stones or hard substances which may appear on the surface, in the spring succeeding that in which it was sown, and cutting out by the roots any thistles, docks, or other large growing weeds. After this some farmers have the surface rolled once, to prepare it for the scythe; this operation is usually effected in March during dry weather.

Use.

The most important particulars connected with the applications of red clover are :—

1st. The soiling process.
2nd. Converting it into hay.
3rd. Retaining it for seed.

1. *Soiling.*—By this term is meant the feeding of stock in a house, shed, or fold, with cut green food instead of making the grass into hay, or depasturing the field. In this way clover is both extensively and profitably employed; it is equally applicable to neat cattle, sheep, and hogs. Pigs may be soiled on clover with great advantage, and Sir John Sinclair says—" there ought to be a patch of clover in the garden of every cottager." In conducting the soiling process the following rules are to be observed :—to give food often and in small quantities; to attend to the manner in which the food is eaten by the cattle, reducing the quantity on the slighest symptoms of loss of appetite; and to be cautious that clover is given sparingly, especially when it is wet, to prevent the cattle being hoven. This may be effectually avoided if care be taken to mow the clover two days in advance. Another correspondent however, of long experience, maintains that cattle or sheep are not so liable to be blown or hoven from eating the clover in a wet, as in a dry state, for this reason, that they do not imbibe so much of the atmospheric air from eating it wet, as when thoroughly dry. It is likewise advisable, (unless the cattle have been brought up from their infancy in houses), to give them the liberty of a yard, in which they may enjoy fresh air and exercise; and when they are fed in stalls, it is indispensably necessary that they should be kept thoroughly clean and frequently curried.

2. *Making clover into hay.*—This process is quite different from the plan of making hay from natural grasses. In all cases clover ought to be mown before the seed is formed; and, indeed, before the plants have fully blossomed, that the full juice and nourishment of the clover may be retained in the hay. By the adoption of this system, the hay is cut in a better season, it can be more easily secured, and is much more valuable, nor is the strength of the plant lodged in the seed, which is often lost. The great advantage of converting under-ripe grass into hay is now beginning to be known. There is much more saccharine matter in it, and it is consequently greatly more nutritious. The crop of clover when cut in the early part of the season, may be ten per cent. lighter than when fully ripe; but the loss is fully counterbalanced, by obtaining an earlier, a more valuable, and more nutritious article; while the next crop proportionably will be more heavy. The hay from old grass will carry on stock, but it is only hay *from young grass* that will fatten them. After being cut, the clover should remain in the swath till it is dried about two-thirds of its thickness. It is then not *tedded* or strewed, but turned over either by the hands or the heads of hay rakes. If turned over in the morning of a dry day, it may be cocked in the evening. The hay should be as little shaken or scattered about afterwards as possible; and if the weather be good, after remaining for some time, according to the season, in the cock, it may be carted into the stack.

3. *Saving clover for seed.*—The common practice is to feed off the clover with horses, bullocks, and sheep, till the latter end of May, it is then to be laid off, and will be ready for harvesting the September following. The seed thus obtained is preferred by most cultivators, and is called *maiden seed,* in contradistinction to the seed obtained from clover that has been previously mown instead of being fed off; for by the latter plan, the seed harvest is at least a month later; and, consequently, the seed from exposure to wet, &c. is not near so good as that obtained by the former method. The quantity of seed varies considerably, averaging from three to eight bushels per acre.

Culture, &c. of the Cow or Marl Grass.

The culture of this species of clover is in every respect similar to that of the red clover, it is a rather hardier plant, the bottom of the stems being woody and solid, not hollow, as is the case with the common red; its root is creeping, while that of the red clover is spindle-shaped, and fibrous. It pushes forth flowering stems all the summer and autumn, if never suffered to perfect its seed. It withstands the effect of severe dry weather better than most pasture plants; continuing to flower even when the surrounding herbage is burnt up on strong loamy soils. Many farmers prefer this species to the red clover, especially on poor thin lands, as it produces a proportionably larger crop and yields more seed; neither are cattle or sheep so liable to become blown, or hoven, from eating this species of clover. In some parts of England, the farmers feed and pasture their store hogs and pigs on cow grass nearly all the summer, with considerable advantage.

Culture, &c. of the White or Dutch Clover.

The Dutch clover is seldom cultivated except for pasturage, for which it is admirably adapted.—*Vide* Grasses.

COMFREY.

Prickly Comfrey (*Sy'mphytum Aspérrimum*), Pentándria Monogy'nia, Linn.; and Boragíneæ, Juss.

The prickly comfrey is a hardy perennial of gigantic growth, introduced from Caucasus, as an ornamental plant, in 1811, by Messrs. Loddiges, of Hackney, as specified in Curtis's Botanical Magazine, where it is figured No. 929. The attention of the agriculturist has recently been directed to the cultivation of this plant as a green food for cattle, by Mr. Grant, of Lewisham: all the particulars yet known respecting its uses and cultivation, are contained in the subjoined letter, addressed to Lord Farnborough by that gentleman.

"March 31, 1830.

"My Lord,—Some years back I happened to have two of the above plants growing near an open fence where my cattle passed daily: as soon as it sprung up so that they could reach it, they fed on it with the greatest avidity: the following year they did the same. I then thought, if it should prove wholesome, it might be turned to good account as green food for cattle generally; and, in consequence, I set about increasing it; and have fed horses, cows, sheep, pigs, and geese, with it, and they have all done well. As it is of such wonderful growth and may be cut successively from April to October, it may be cultivated to great advantage.

"For horses, to be put in the racks, spread on pastures, or the green stalks to be cut with chaff, it will be found most useful. About two out of three will take it upon first trial; the others will soon follow, and when once the taste is acquired, they will never leave it. My neighbour Moorey, the veterinary surgeon, had a young mare last autumn, very bad with the strangles; so much so that she had left off feeding. He thought of the comfrey, and sent for me: she immediately began to feed on it, and she soon got well; he considers that on account of its oily nature it was of the greatest service.

"Cows do not take it in the first instance so freely as the horse, but they all soon take to it, and then they are quite as eager for it. In 1827 I fed the worst cow I had entirely upon it for some length of time, she did well, and milked better than she had done before. The cream was thicker and good flavoured.

"For sheep and lambs it is very good: they take it freely. Lambs will feed on it before they are a month old, and as it is such an early plant and will immediately follow the turnips, either to be spread on pastures or put in racks in the folds, on fallows, it will be found of great service.

"For pigs it is very useful, they eat it freely and do well. I kept a sow chiefly on it with twelve pigs: she brought them up well; they all fed on it before they were three weeks old: geese do well with it, the young ones will feed on it as soon as hatched.

"I have no hesitation, my Lord, in pronouncing it a most valuable discovery, as it will grow in all soils and situations superior to any other plant: it may be planted by the sides of ditches in any waste corner of fields, orchards, gardens, &c., where useless rubbish grows; it is a plant that no one can lose by, as the only expense is the purchase of a few in the first instance; it may soon be increased to any quantity and when once established, I believe it will last for ever. I never knew a plant to die, and I know some that have stood more than twenty years, and are as full of vigour now as they have ever been. It is now ready for cutting, which shows it is a plant of such early growth that it must come into general use.

"I have no doubt that in a few years it will be cut and carried in bundles, and sold about the streets of London and all other great towns, as tares, rye, clover, &c., now are; as it comes before, with, and after them, and the produce being so enormous, and the expense so trifling in comparison with all other crops. I have cut it when more than seven feet high, and as thick as it could stand on the ground. I once cut and weighed one square rod, the average was seventeen tons three hundred per acre. I have no doubt but in the course of the year the produce would have been thirty tons.

"I cannot undertake to say what effect continual cutting may have on the plant or on the land for many years together; but, as far as I have experienced, it does not weaken the plant. I have cut it three times in the year, and found the plant equally strong the following spring. The proper distance for planting is from two to five feet square according to the quality of the land. It may be planted at any time of the year; but like other herbaceous plants, it moves best when in a growing state.

"I am, my Lord,
"Your obedient humble servant,
"D. GRANT.

"N.B. Most of the farmers in the neighbourhood who have seen it, are so satisfied of its quality and produce that they are making plantations of it."

CORIANDER.

Coriander (*Coriándrum satívum*), Pentándria Digy'nia, Linn.; and Umbellíferæ, Juss.

The coriander is an indigenous plant, flowering in June.

Culture, &c.

SOIL.

A sandy loam.

PROPAGATED.

1. *By seed*, which may be sown, should the weather prove favourable, as early as February. The seed should be sown nearly half an inch below the surface, in drills nine inches apart; and for a bed six feet by four, half an ounce of seed will be required.

2. Should a succession be required, small monthly sowings may be made during the summer, as the plants at this season will soon run up to seed.

3. The plants will not bear transplanting, and therefore must remain where sown.

USE.

1. The leaves, for soups and salads.
2. The seeds, for druggists, distillers, confectioners, &c.

CRESS.

Three varieties of cress are cultivated in our gardens.

1. Common Garden Cress (*Lepídium satívum*), Tetradynámia Siliculósa, Linn.; and Crucíferæ, Juss.

2. American Cress (*Barbareà Præ'cox)*, Tetradynámia Siliquósa, Linn.; and Crucíferæ, Juss.

3. Water Cress (*Sisymbrium Nastúrtium)*, Tetradynámia Siliquósa, Linn.; and Crucíferæ, Juss.

Culture, &c. of the Garden Cress.

There are three varieties of this plant in cultivation.

1. *Common Plain-leaved.*—Generally preferred for salading.
2. *Curl-leaved.*—Employed principally as a garnish.
3. *Broad-leaved.*—Seldom brought to table, and chiefly cultivated for rearing young turkeys.

SOIL.

All the varieties prefer a fine rich garden-soil.

PROPAGATED.

1. By seed; and, if sown in beds, one ounce will be sufficient for a bed four feet by four.

2. In preparing the ground, it should first be well dug, then raked and made very fine. The seed sown thickly on the surface in rows five or six inches apart, covering them slightly with mould, finely sifted in dry weather occasional watering will be necessary.

3. As successional crops are in constant demand, the sowings should be made weekly; and for early spring crops the first sowing may be made in the beginning of March, and continued in the open air until the latter end of October. Protection will be required at night both in the spring and autumn. For winter use the seeds are generally sown

in pots filled with old tan or rich garden-soil, and then placed in hot-beds or a stove.

USE.

The leaves for small salad; and, from their peculiar grateful and pungent taste, are generally preferred to all others for that purpose.

Culture, &c. of the American Cress.

SOIL.

Prefers a light dry soil.

PROPAGATED.

By seed, sown either broad-cast or in drills, the latter being generally preferred: a quarter of an ounce of seed will be sufficient for a drill ten feet in length; the drills may be drawn at distances of nine inches apart, the seed being evenly raked in; if in constant demand, the sowings ought to be made every five or six weeks, from March to September. In hot weather, water must be given; and on the approach of winter, the plants must be sheltered by a light covering of ferns, reeds, or straw.

USE.

Principally as a winter cress and early spring salad.

Culture, &c. of the Water Cress.

There are three varieties of this plant.

1. *Green-leaved.*—The easiest cultivated.
2. *Small Brown-leaved.*—The hardiest variety.
3. *Large Brown-leaved.*—The best for cultivation in deep water, and preferred by most persons to either of the other varieties.

PROPAGATION.

1. For the successful cultivation of this plant a constant stream of water is required, which should be shallow and free from mud, for cress will not thrive in a muddy bottom, nor taste well if the roots are immersed in the mud; a gravelly or chalky bottom is, therefore, indispensable.

2. In making a bed, the youngest plants with most roots should be selected; these should be placed at the bottom of the stream on the gravel, in rows at eighteen inches distant, placing a stone on each plant to retain it in its proper situation. The above distances are applicable only to shallow streams; for should there be considerable depth of water the plants must then be placed at the distance of six or seven feet apart at least. The beds should be made either in May or June, or else deferred until the following September or October.

3. When re-planting becomes necessary, the whole bed should be cleared, beginning at the stream-head.

4. In taking the crop, the stems should never be broken, but carefully cut off, so as not to disturb the roots: if this precaution be taken, vigorous shoots will be emitted, continuing in growth for several months.

USE.

For salad, and is in great request during the spring months.

CUCUMBER.

Cucumber (*Cúcumis sativus*), Monœ'cia Monadélphia, Linn.; and Cucurbitáceæ, Juss.

The cucumber is a tender annual, introduced into this country in 1573 from the East Indies; its cultivation is an object of emulation

amongst almost all gardeners and tradesmen; its varieties are numerous, but Loudon enumerates the following as being the most worthy of cultivation:—

1. *Early Long Prickly*, from five to seven inches long, of a green colour, with few prickles. The plant is a good bearer; and upon the whole, this is accounted the best cucumber for the general summer crop, the pulp being very crisp and pleasant.

2. *Longest Green Prickly*, from seven to ten inches in length; it has a dark-green skin, closely set with small prickles. This is a hardy sort, but does not come early.

3. *Early Short Prickly*; not more than four inches long; the skin green, rather smooth, but with a few small prickles. This is one of the hardiest and earliest sorts, and is often preferred for the first crop.

4. *Dutch or White Short Prickly*, though not so much cultivated, is recommended by some as preferable even to the long prickly; it has fewer seed, is evidently different in taste from most other cucumbers, but of agreeable flavour.

5. *Cluster Cucumber*; a very early sort, the flowers appear in clusters of three or four together; the fruit is seldom more than five inches long; it is a fruit of a fine green colour, but becomes yellowish as it ripens. The stems of this variety are much inclined to climb, by means of their tendrils, upon sticks; the leaves are small, and the plant altogether occupies but little room.

6. *Smooth Green Roman*, an early sort, the fruit becomes large and long, and is quite smooth; the plants grow very strong, and require a good deal of room.

7. *White Turkey*.—The stalks and leaves are larger than in the other varieties; the fruit also is very long, sometimes from ten to fifteen and even twenty inches; it is quite straight, and has a smooth skin destitute of prickles; it is produced sparingly, and late in the season.

8. *Long Green Turkey*, sometimes sown for the late crop. Late cucumbers, however, are much less cultivated than the early varieties, most gardeners being of opinion that those kinds which are best for the early crops are also best for the late.

9. *Napal*, fruit very large, usually weighs upwards of twelve pounds weight, measures in girth twenty-four inches, and in length seventeen inches; flavour pleasant, and esteemed for stewing. Sent to the Horticultural Society from Calcutta by Dr. Wallich.—(*Hort. Trans.* iv.)

10. *Hanagan's*, near too feet long, and of superior crispness and flavour.—(*Hort. Trans.* iv.)

11. *Fluted Cucumber*—A Chinese variety. (*Hort. Trans.* v.)

The instructions relative to the cultivation of cucumbers, naturally divide themselves into two sets: one applicable to the raising of cucumbers in hot-beds, and the other to the mode of raising them in the open ground, or with some little portion of artificial heat. With respect to the former, the general management of the cucumber and the melon are so nearly alike, that it will be advisable to detail their culture under the same head;—ample directions for forcing the cucumber will therefore be given under the article *Melon*, which see. With respect to the latter, the following details, it is presumed, will be found amply sufficient.

Culture, &c.

Propagated from seed, which ought to be from two, at least, to four years old, in preference to greener seed, which is more apt to run luxuriantly in vine, and the plants from it do not show fruit so soon nor so abundantly as those from seed of a greater age. But when seed has been kept more than four years, it is sometimes found to be too much weakened.

PROPAGATION *under Hand-Glasses.*

Towards the middle or end of April sow the seed in a cucumber or melon bed, and when they are come up plant them out into small pots, two in each, and give them a little water to keep them moist, but not wet. In the middle of May choose a compartment of ground lying warm, and where the soil is rich and light, and dig out a trench two feet deep and three and a half wide, and the length according to the number of glasses that it is intended to contain, at four feet distance from each other. Then fill the trench in with good warm dung, broken well and trod down evenly, leaving the dung about three feet thick from the bottom of the trench, that will be allowing one foot for setting; as soon as the bed is thus made, cover it over immediately either with the soil of the garden or with sods of turf, preferring the latter if they can

be procured. Do not allow any part of the dung to be exposed, that the fermentation may go on regular. Insert trial sticks in different parts of the bed, and when the dung is come to its full heat put on about six inches more (allowing the first covering to be two inches), and immediately put on the glasses, four feet apart, and when the mould is warm under, turn the plants out of their pots, with their roots entire and balls unbroken, and insert them under the glasses, one ball, containing two plants, under each, and give them a little water directly to settle the mould about them; place the glasses immediately over them and keep them close till they make fresh roots and begin to grow, when a little air must be given by raising the glasses a little on one side, and as the warmer weather comes on give air more freely, in order to inure them to the open air. When the plants begin to fill the glasses raise them up on bricks, to bear them from the tops of the plants.—When the plants begin to fill the glasses a second time they must be trained from under them in an horizontal direction, laying sticks, similar to pea-sticks, upon the soil for the vine to run upon, as they always do better on these than on the ground. The plants will require but little more attention farther than watering sufficiently in dry weather, and to continue to lay sticks to catch the vines as they run. If the summer proves fine and favourable they will come into bearing in the latter end of June, and continue two or three months. When all danger of frost is over take the glasses quite off.

Should dung be scarce, circular holes may be dug, eighteen inches deep, two feet across, and about five feet asunder, and filled in with hot dung, trod moderately firm, and immediately covered with about six inches thick of light rich mould, and the glasses immediately set on, and when the soil gets warm either plants or seeds may be put under them, and if managed as above they will produce plenty of fruit from the latter end of June to the end of September, supposing the plants to be put in the first week in May.

Proper attention must be had to watering in dry warm weather; two or three times a week will not be too much till June, and after that time a little every day will be required, giving it in the evening from June to August, as the weather is warmer or cooler. At other seasons morning is the best time. Soft or rain water must always be used in preference to well or spring water, which is injurious to the plants.

Propagation in the open air, on the natural ground, without the aid of dung.—To have a crop on the natural ground, for pickling, sow the seed in a warm situation, and where the soil is light and rich, towards the end of May or beginning of June, or as soon as the weather is settled warm. After having dug the ground even and neat form shallow basins in the soil, about an inch deep, and drop eight or ten seeds in each and cover them half an inch deep. When the plants are come up they must be thinned out, leaving only three or at most four in each patch. The patches should be in lines six feet asunder and three feet apart in the lines.

After the plants have begun to run and advance in growth, the leading runners must be trained out on sticks as the others. They must be freely supplied with water two or three times a week, and more frequently in hot dry weather, or the crop will fail.

This crop will come in the beginning of August and continue till the middle of September, when it will go off. This crop, both for

pickling and other purposes, should be gathered while it is young and in prime. For pickling the fruit should not be more than three inches long.

CURRANT.

Currant (*Ribes*), Pentándria Monogy'nia, Linn.; and Grossuláceæ, Juss.

There are two species and many varieties of this wholesome and agreeable fruit.

1 Red Currant (*Ribes rubrum*).
2 Black Currant (*Ribes nigrum*).

Culture, &c. of the Red Currant.

There are not less than twenty-four varieties enumerated in the Transactions of the Horticultural Society, differing materially from each other both in size and colour. The following selection embraces the best:—

Red Currants.	*White Currants.*
1. Common Red	1. Common White
2 Dutch Red	2. Large New White Dutch
3 Large Dutch Red	3. White Crystal
4. Large Red	4. Pearl White
5. Large Bunched Red	5. White Dutch.
6. Wilmot's Pale Red	
7. Champagne.	

Of the above varieties, the Common Red, Dutch Red, Champagne, Common White, and Dutch White, are deemed the best for general cultivation.

SOIL.

The currant will thrive in almost any soil or situation, but succeeds best in a strong rich loam.

PROPAGATED.

1. *By cuttings, by suckers,* and *by seed,* the former, however, is the mode usually practised; for which purpose, strong straight shoots of the last summer's growth, are to be taken with a small portion of the preceding year's wood at the bottom of each cutting, in length varying from nine to twelve inches. The incision should be made in an horizontal direction, with a sharp knife, that the bark may not be ragged or bruised, and all the buds must be cut off from the bottom, leaving three, or at the most four at the top. This mode of procedure effectually prevents the growth of suckers, which, without this precaution, would be constantly emitted; the cutting thus prepared is to be inserted nearly half its length firmly into the ground.

2. The season for planting the cuttings may be either in the autumn, just before the leaf begins to fall, or early in the spring, in the month of February; and for nursery culture may be disposed of in beds planted in rows from twelve to fifteen inches asunder.

TREE.

1. May be planted any time from the fall of the leaf till February or March, in open weather, the ground being previously dug to the distance of two feet

2. Plants required to bear in the following summer should be moved the previous autumn.

3. Plantations, when required, should be formed into parallel lines, the rows being from eight to ten feet asunder, and the trees six feet apart in the rows.

4. As a succession of fruit is always desirable, it will be advisable to plant in different aspects. For *early* produce an open southerly aspect should be chosen; for an

intermediate supply, an eastern or western site may be selected; and for *late* production nothing can be better than a northern exposure; and if trained against a wall may be preserved by means of nets and matting until the latter end of October, and even later.

5. The young tree when planted ought never to be suffered to have any limbs within five or six inches of the ground, but should have a clear and straight trunk to that height; when the shoots come out there should not be more than four or six suffered to grow as principal limbs. By shortening the shoots at the end of the first year, the number of limbs will be doubled; these are to be kept constantly clear of side shoots, by cutting off every winter the last summer's wood within one or two buds of the limb; and when the limbs have attained their proper length, the shoots at the end of each limb should also be annually cut off, so that the tree when it has received its pruning consists of a certain number of limbs resembling so many rugged sticks, with bunches of spurs sticking out of them; on these spurs the fruit is produced in prodigious quantities. This mode of pruning is almost universally adopted by the *London market gardeners*, and it has been asserted "that one tree pruned in this manner, is equal to more than six trees pruned in the manner practised in general throughout the country."

6. Currant trees not only bear their fruit on the *spurs* just described, but also on the young wood of one, two, or three years growth; but the fruit produced on the last year's shoot is always finest; if, therefore, it is required to obtain fruit from the *young-wood* instead of the *spurs*, an altogether different mode of pruning must be adopted: for this purpose Abercrombie recommends both a summer and winter pruning.

Summer Pruning.—In May or June, the most irregular shoots rising in the centre of the tree, as well as the cross and water-shoots, are to be removed; by this operation the influence both of the sun and air is more powerfully exerted in maturing the fruit. All root-suckers should be twisted off as they appear; but if the buds are removed at the time of planting the cuttings, as before directed, this step will be rendered unnecessary.

Winter Pruning.—This extends both to the *old* and *young* wood. All cross and irregular shoots with those not required to supply vacancies, are to be entirely removed; but good lateral shoots may be spurred as before directed. With respect to the *old wood*, all the decayed and cankery parts should be cut out, and those bearers that are naked and barren completely taken away, and to supply these deficiences, well placed young shoots must be retained; it will be well also to preserve some of the finest shoots for successional bearers, and where the spurs are too thick, they should be carefully thinned. The trees should always be kept well furnished with full bearing branches, and advancing young bearers, in a regular open expansion, from six to ten inches asunder at the extremities; circumscribing the general head within the height of three or four feet.

7. For *Wall-trees* and *Espaliers* the same course of summer and winter pruning is applicable; the following additional points, however, are to be observed:—all foreright and irregular shoots may be either spurred or entirely removed, during summer the retained shoots should be trained at full length, and in the winter they may be shortened to twelve, fifteen, or eighteen inches, according to their strength and allotted space. The branches may be nailed, or, what is preferable, tied more or less horizontally, at a distance of from four to six inches apart.

8. After the winter pruning, the ground should be dug or forked over, taking care not to injure the roots, adding at the same time, such manure as the defects of the soil may require.

9. *Insects.*—These are principally the caterpillar (*Phalæna Grossularia*,) and the *Aphis Ribes*, which latter indents and puckers the leaves, covering them with red or crimson spots, at the same time depriving the fruit of its flavour and plumpness; both may be destroyed by watering with lime water.

USE.

Currants are much employed for making jellies, jams, wines, &c. and at the dessert they are greatly esteemed, being both grateful and cooling to the stomach. Medicinally they are moderately refrigerant and aperient.

Culture, &c. of the Black Currant.

There are five varieties enumerated in the Catalogue of the Horticultural Society.

1. Wild Black Currant.
2. Black Grape.
3. Black Naples.
4. Russian Green.
5. Common Black.

The Common Black is the only variety in general cultivation.

SOIL, *&c.*

The black currant prefers a rather moist salt soil, and a shady situation; although, according to Miller, the fruit is always best when the plants are placed in an open situation, and a light loamy soil.

PROPAGATED.

By cuttings, which are raised in a similar manner to those of the red currant.

TREE.

As the Black Currant bears its fruit chiefly on the young shoots of the preceding summer's growth, rather than on spurs, so in the pruning care must be taken to preserve a necessary supply of young wood; the leading shoots from the principal limbs must not be shortened, unless they assume a rambling growth, or become fruitless from age; then the limb must be entirely removed, and a well placed lateral trained in its place. All foreright and cross shoots may either be removed or spurred, as in the red currant; and all decayed wood and cankery parts entirely cut out.

USE.

Chiefly for wine and jellies. The jelly forms a popular but doubtful remedy in complaints of the throat.

DAIRY.

In treating of the Dairy we propose adopting the following arrangement:—

1. Situation of the Dairy.
2. Nature and Properties of Milk.
3. Making and Curing of Butter.
4. Process of Cheese Making.

1. *Situation of the Dairy.*

1. The dairy house should be erected in a situation which is airy. The walls and roof protected from the influence of the sun, that the temperature throughout the year may range from fifty to fifty-five degrees; hence, a northern aspect will be most desirable. A dry situation should be selected to give facility to cleanliness; all stenches are injurious—it will therefore be advantageous to use spring water frequently (and especially during the warm weather), which, if the situation be favourable, may be supplied by a pipe leading from some neighbouring spring. In conducting a Butter Dairy, it will be advisable to divide it into three compartments, a milk house, a churning house with conveniences for washing and scalding the implements, including a suitable boiler, and a room appropriated for keeping them in, and where they may be dried when the weather is unfavourable. A cheese dairy may be divided into a milk house, a scalding and pressing house, and a salting house. The milk dairy requires only two apartments, a milk house and a room for scalding and cleansing the utensils, and for other necessary purposes.

2. The utmost cleanliness should be observed throughout. All the utensils employed in making butter should be scalded, scrubbed, rinced, and dried every time they are used. In making cheese it is not so necessary to scald as it is to have them well washed and dried every day. When vessels become tainted with the acidity of milk, such vessels act like a leaven to every thing placed in them, and should be thoroughly cleansed by boiling; but when this is not effectual, alkali added to the boiling water will be found essential, afterwards the utensil must either be boiled or immersed for two or three days in pure water.

2. *The Nature and Properties of Milk.*

The *Chemical Properties* of this secretion differ somewhat in different animals. The milk of the cow has been most attentively examined, and it has the following properties:—

1. It is nearly opaque; white or slightly yellow; of an agreeable sweetish taste, and a peculiar smell. Its specific gravity varies from 10·18 to 10·20. It boils at a temperature a little above that of water, and freezes at 32 deg. When allowed to remain a few hours at rest, a thick unctuous liquid collects upon its surface, called *cream;* the colour of the remaining milk becomes bluish white, and when heated to about 100 deg. with a little *rennet*, it readily separates into a *coagulum* or curd, and a *serum* or *whey*. In this way, the three principal constituents of milk are separable from each other.

2. By the process of churning, cream is separated into *butter* and *butter-milk*; the latter being the whey united to a portion of curd. Butter may be considered as an animal oil, containing a small portion of curd and whey.

3. The *curd* of milk has the leading properties of coagulated albumen. Curd, in combination with various proportions of butter, constitutes the varieties of cheese. That containing the largest quantity of oil becomes semi-fluid when heated; it is prone to decomposition, and a large quantity of ammonia is then formed in it; whereas, bad cheese,

which consists of little else than curd or albumen, shrinks and dies when heated, curling up like a piece of horn.

4. Whey is a transparent fluid of a pale yellow colour and a sweetish flavour; by evaporation, it affords a minute quantity of saline matter, and a considerable proportion of sugar of milk.

Having stated the chemical properties of milk, it may perhaps be advisable to advert to some observations made by Dr. Anderson relative to the quantity of cream which is obtained at various periods during one milking:—

"The first-drawn milk from any cow, at any time, is always much thinner, and of a worse quality, than that which comes afterwards, the richness continually increasing to the very last drop that can be drawn at that time;" so that if the milkers do not perform their task thoroughly, even to the last drop, or supposing to the last-half-pint, the owner loses as much cream as would be afforded by six or eight pints at the beginning, the last quantity containing the richness and high flavour of the butter in a high degree. This the Doctor proves by various experiments, thus:—"Having taken several large tea-cups, exactly similar in size and shape, and filled them at regular intervals, during the period of one milking, the last being filled with the dregs of the milk; they were each weighed, so as to ascertain that the quantity of milk was exactly the same. The quantity of cream obtained from the first-drawn cup, in every case, was much less than from that which was last drawn; and those between afforded less or more as they were nearer the beginning or the end. It is unnecessary to specify intermediate proportions; but the quantity of cream obtained from the last-drawn cup, from some cows, exceeded that in the first in the proportion of 16 to one. In other cows however, and in particular circumstances, the disproportion was not quite so great; but in no case did it fall short of the rate of eight to one. Probably, upon an average of a great many cows, it might be found to run as ten or twelve to one.

"In the next place, the difference in the quality of the cream obtained from the two cups was much greater than the difference in quantity. In the first cup the cream being a thin tough film, and very white; but in the last two of a thick but yraceous consistence, and of a glowing richness of colour, that no other kind of cream is found to possess.

"The difference in quality of the *milk* that remained was, perhaps, still greater than either the quantity or quality of the cream, that in the first cup being a thin bluish liquid, while that in the last was of a thick consistence and yellow colour, more resembling cream than milk both in taste and appearance."

If milk be put up in a dish, and allowed to stand till it throws up a cream, that portion which rises first to the surface is richer in quality, and greater in quantity, than that which rises in a third equal space of time; and that of the third than that of the fourth, and so on, decreasing in quantity and declining in quality as long as any rises.

Thick milk always throws up a smaller portion of the cream that it actually contains, than milk that is thinner; but the cream is of a richer quality, and if water be added to that thick milk, it will afford a considerably greater quantity of cream than it would have done if allowed to remain pure; but its quality is, at the same time, greatly debased.

"Milk which is put into a pail, bucket, or other proper vessel, and carried in it to any distance so as to be much agitated, and in part cooled before it be put into the milk-pans to settle for cream, never throws up so much nor so rich cream, as if the same milk had been put into the milk-pans directly after it is milked."

Since the time of Dr. Anderson's observations, an ingenious instrument has been invented, called a *Lactometer*, by which the quantity of cream from a given quantity of milk may be observed by mere inspection. The description and application of this instrument are clearly shown in the following extracts from a letter received from Miss A. Bradshaw, of Linfield, who, in connection with this subject, has made some judicious remarks on the produce of cream dependant on the nature of the pasturage on which the cows are fed.

"The lactometer, is a straight glass tube with a mark at the top to denote a hundred parts of milk, that must be put in when it comes from the cow. The upper part is graduated, perhaps twenty or thirty degrees downwards; and after the milk has been in it ten or twelve hours, it will be very visible what per centage of cream the cow's milk gives. Thus,—if it is in the 15th degree, the cream will be 15 per cent. The last milk taken from the cow has always the greatest portion of cream, and this will often vary, according to the food the cow is getting. Tares and lucern will produce good cream in summer, and beet and mangold wurzel in winter; and if a small quantity of salt-petre be dissolved in warm water and put into the cream previous to its being churned, it will take away any unpleasant flavour those roots might otherwise impart to the butter. When it is wet weather, the cream will not be in so great a quantity as in fine dry weather, and the richer the ground is that the food comes off, the more cream there is, and the better the milk; upon an average I get one pound of butter from twelve quarts of new milk, and four quarts

and one pint of cream produces 4 lbs. of butter, as the soil gets richer. I have observed that it takes a less quantity of milk for a pound of butter, and a greater quantity of butter will be produced from one quart of cream in summer. I skim my milk every twenty-four hours, but this depends partly upon the state of the weather: if it be cool, I can keep it thirty-six hours; in winter, it may stand from thirty-six to forty-eight hours very well. Cleanliness is of the greatest importance; and it is always necessary to take care not to dip the skimmer into the milk which has stood the longest, and afterwards into that which has been strained up a shorter time."

3. *The making and curing Butter.*

Milking.

1. Cows are generally milked but twice in twenty-four hours, (morning and evening); but for the first three or four months after calving, the milk being then much more abundant, it would be better to perform this operation three times a day. It is important that the milk be drawn off clean, otherwise it will not only be less in quantity and inferior in quality, but the cow will also be dried off prematurely.

2. The milk, when brought in from the cows, should be strained through a fine hair searce or strainer, and placed in clean pans. It is a practice with many to keep the morning and evening's milk in separate pans, as the former is much superior to the latter in quality. A tin skimmer with holes in it is the best for taking off the cream, which is then transferred to a vessel called a cream-receiver.

3. The period for keeping the cream previous to churning varies from two to four days. To ensure success, a certain degree of acidity seems necessary; to effect this, a little old cream, rennet, or lemon-juice, is sometimes added.

4. The churn, whether pump or barrel, should be made of the best well-seasoned white oak, and, as cleanliness is of the first importance, great attention should be paid to the washing, drying, and airing of the churns, immediately after use, otherwise they are sure to contract a sour and unwholesome smell, which must injure the quality of the butter. In the process of churning, great nicety is required; a few hasty irregular strokes or turns has been known to spoil what would otherwise have been excellent butter.

5. The best time for making butter, according to usual practice during the summer season, is early in the morning, before the sun has attained much power. But this, of course, depends upon contingencies on which it is impossible to calculate. Science, however, has reduced that to a certainty, which hitherto has been a matter of doubt. Butter, of the best quality, can only be produced at a *certain temperature*. And the knowledge of this fact is of such importance, that we earnestly invite the attention of our readers to the following details, for which Mr. Ballantine obtained the highest premium offered by the Highland Society of Scotland:—

"The degree of thermometrical temperature at which butter from cream can be obtained, ranges from 45 to 75 deg. of the scale of Fahrenheit; and, from the annexed experiments, it appears that the greatest quantity of butter, from a given quantity of cream, is obtained at 60 deg. and the best quality at 55 deg. in the churn, just before the butter comes; for, in the experiments made, it was found that the heat rose four degrees during the operation of churning, though the temperature of the milkhouse was the same. Repeated experiments, made at this degree of heat, gave butter of the finest colour and quality, the milk being completely separated from the butter, which, when washed and made up in rolls, kept for a fortnight, without acquiring either smell or taste. At 60 deg. the quantity is greater, but the quality much inferior, being soft and spongy, and giving out a considerable quantity of milk, when salt was applied, which may account for the additional weight. Several experiments were made with heat, up to 75 deg. the result of which, as will appear by the table, completely accounts for the great quantity of inferior butter made in the country.

"By taking high heats, on purpose to accelerate the churning, the milk not being taken from the butter, it cannot keep either sweet or salted. When the heat exceeded 65 deg. no washing could detach the milk from the butter, without the aid of salt: but when a quantity of salt was wrought well into it, and the mass allowed to stand for twenty-four hours, and then taken to a well of spring water, and repeatedly washed, the milk by this process was got out, and the butter re-salted in good order.

"According to *Experiment* No. 1, sixteen pounds and a-half of butter (sixteen ounces to the pound), were obtained from sixteen Scotch pints of cream, and, from several experiments at the same heat the result was the same; that is, more butter was produced from the same quantity of cream than at any other heat, though the quality was inferior, both as to colour and texture, to the butter produced from heat, as in *Exp.* No. 2, which was of the very best quality, and the quantity the same as in No. 2, except towards the middle of September, when an increase of about six ounces was got from the sixteen pints of cream, in consequence of the milk producing richer cream than in the summer months.

"*Exp.* No. 3.—The same heat was taken, but the experiment was made in a different form, and with milk from different cows, though the pasture was much the same. The churn was placed in the kitchen, exposed to a temperature of 60 deg.; but, by removing

it to an out-house, the heat was brought down to 52 deg. at four o'clock in the morning, and, just as the butter was forming, the heat was found to be 56 deg. having risen four degrees. The quality was such as would insure a ready sale in any market, at one penny or two-pence per pound above what I saw in the house made at a former churning. No. 3. in the table is an average of four experiments, made at the same heat, in all of which the butter was excellent.

"*Exp.* No. 4. Heat of cream, when put into the churn, 65 deg.—rose to 67 deg.—in thirty minutes butter came, but it was what is called *bursting the kern*. The quantity was deficient, and the quality really bad, being white, short, and bitter. Both salt and saltpetre were applied without effect, for the butter continued soft and pale. A few more experiments were made on a small scale, with heats as high as 75 deg., and, although butter was got, yet it was of such a quality as was only fit for grease butter.

"*Exp.* No. 5, is the result of several churnings, taken at 50 deg. in which the butter was of good quality, but evidently injured by being so long under the churning process.

"From these experiments it appears, that the temperature at which butter from cream can be obtained, *in the greatest quantity*, is 60 deg. in the churn, just before the butter is formed, or 65 deg. when put into the churn.

"The *best quality* at a temperature of 51 deg in the cream, and 55 deg. in the churn.

"The temperature at which butter from cream can be obtained in the *greatest quantity and of the best quality*, is the medium of Exp. No. 1. and 2, or 53½ deg. of cream, and 57½ deg. in the churn before butter comes, as appears from No. 6. which gives the result of several churnings, taken at the medium heat of Nos. 1 and 2. At this heat every advantage is gained as to quality, and any additional quantity that may be obtained by higher heats, is only so much milk retained in the butter, which most greatly injure its quality. If the churning-house is properly constructed, it is easy to gain this heat through the whole season; for, when the heat of the air was 75 deg. through the day, it was only 50 deg. in a thatched milk-house, at four o'clock in the morning; and when the heat is below that, with the assistance of hot water, you can bring it up to the heat wanted.

"If the churning process is then carried on with heats, as in Experiment No 6, every advantage will be gained, as far as heat is concerned. Butter intended to be sent to the market sweet, should be carefully gathered from the milk with the hand, and the milk gently squeezed out of it. It should then be put into cold spring water, and, after being well washed, it should be made up into rolls, with wooden flappers, and put into cold water to firm, but should not be allowed to remain longer than is necessary to firm it, as the water hurts both its flavour and colour, the salt should be well wrought into it, before it is pushed into the store kit.

No.	Date.	Scotch Pints of Cream	Degree of heat. in the Cream.	Degree of Heat when Butter came.	Quantity of Butter, 16 oz. per lb.	Time of Churning.	Weight of Cream of 16 Ounces	Heat of the Air at 8 P.M.
1.	1825. June 13.	16	56	60	16 lb. 8 oz.	1½ hours.	4 lb. to Pint.	56 deg.
2.	1825 June 20.	16	52	56	16 lb.	2 hours.	4 lb. to Pint.	52 deg.
3.	1825 June 24.	16	52	56	16 lb.	2 hours.	4 lb. to Pint.	52 deg.
4.	1825 July 12.	16	65	67	15 lb. 8 oz.	30 min.	3 lb. 14 oz. to Pt.	70 deg.
5.	1825. Oct. 20.	16	50	53½	15 lb. 12 oz.	3 hours.	4 lb. 1 oz. to Pint.	50 deg
6.	1825. Aug 20.	16	53½	57½	16 lb. 5 oz.	1½ hours.	4 lb to Pint.	

No. 1 shews the greatest quantity of butter produced by the above heats.
No. 2. the best quality of the butter.
No. 3 The fine flavour and quality of this butter could not be surpassed.
No. 4. The quality soft, white, and milky.
No. 5 Quality injured by long churning.
No 6. Answer to the Society's query. Quality most excellent, high in colour and flavour, and solid as wax."

6. The butter, immediately after being churned, should be thrown into fresh spring water, where it should remain for a sufficient time to make it firm; some limit it to an hour (more or less), according to the season of the year: and at the end of the third or fourth washing, some fine salt should be put into the water, which will raise the colour of the butter, and purge away any milk that may remain among it. Before salting, it is very essential that no milk or water be left, otherwise a strong smell and unpleasant taste will be the certain consequence. The butter thus prepared should be immediately salted, the maker exercising his own judgment in doing so. The mixing of the salt with the butter should be done in wooden dishes, after the water and milk are completely expelled. The operation concludes by weighing and making up the butter in the usual manner, either for the table or market.

7. In winter, the butter generally loses a portion of its richness, and assumes a lighter colour, in which case a small quantity of arnotto may be reduced to a fine powder, and mixed with the cream before it is put into the churn, The juice of the carrot and the flowers of the marigold, expressed and strained through a linen cloth, impart a similar colour, and are certainly more wholesome.

8. The milk of new-calved cows should never be set for butter until at least four days after colouring, as a small quantity of such milk will impart a disagreeable taste to the whole of the cream to which it is added. The practice of scalding cream in cold weather should also be avoided, as cream thus treated will never make good butter.

9. Turnips, carrots, &c. impart a disagreeable odour to the milk, which may in a great degree be counteracted by a weak solution of nitre in spring water, applied in the proportion of one small table-spoonful to every two gallons, as soon as the milk comes into the dairy. It may also be removed by the following simple process:—

Let the bowls, whether of lead, wood, or earthenware, be kept constantly clean and well scalded with boiling water before using. When the milk is brought into the dairy, to every eight quarts add one quart of boiling water; and then put the milk into the bowls to stand for cream By keeping strictly to this practice, sweet and well-tasted butter has been made all the winter from cows house-fed upon turnips solely.

Salting and preserving Butter.

Butter should be salted and cured as soon as possible after it is made. The proportion of salt to a pound of butter is one ounce; but when it is not intended to be kept through the winter and spring, the proportion may be smaller, and regulated according to the taste of the curer. Some persons, to a pound of salt add four ounces of sugar; the salt, at all times, must be kept perfectly dry. In Ireland, the use of salt aud salt-petre is recommended in the proportions of one ounce of stored rock or bay salt, and one-fifth of an ounce of salt-petre, to twenty-eight ounces of butter.

After the butter is made it will be desirable to put it down as early as convenient. The casks should be made of oak, ash, or lime-tree; the latter is to be preferred: the wood should be boiled for four hours previous to being made into casks, and afterwards well soaked in spring water. Whether casks or crocks are used, the greatest cleanliness should be observed. Old and new butter should never be mixed, nor should two makings; however, should there not be a sufficient quantity collected in one day, to fill a package when cured, the quality of the butter may in a great measure be preserved by giving it a partial salting, and covering it over with a clean linen cloth, placing it in a cool place. Butter should be well pressed down, its surface covered with pure salt, and the lid put securely on to exclude the air.

In small dairies, for domestic use, the butter is pressed down in layers, on each of which pure salt is strewed: when the crock is filled it is tied down.

4. Process of Cheese Making.

The production of cheese embraces the following particulars:—

1. The Season.
2. Periods of Milking and the Qualities of the Milk.
3. Preparation of the Rennet.
4. The choice of Colouring Matter.
5. The Setting, Breaking, and Gathering of the Curd.
6. Management of the Cheese in the Press, Manner of Salting, and Management in the Cheese-room.

1. The Season.

The best season for making cheese is when the cows can be fed in the pastures, from the beginning of May till the end of September. In Gloucester the season continues from April to November, May and June being the principal months.

2. Periods of Milking and Qualities of the Milk.

The times at which milking is performed in Cheshire during summer, is at six o'clock morning and evening; during winter, as soon as light, and before dark commences. In Wilts and Suffolk, it is began by four in the morning, and therefore over before the heat causes the cow to become restless and uneasy. The milk should be put into pans immediately, that it may be expeditiously cooled.

The goodness of the cheese depends principally on the richness and quality of the milk. A one meal cheese is so termed when the whole of the produce of one milking is employed in its simple state for the production of the cheese; but sometimes the cream, either wholly or in part, is removed from the first milking or meal, and blended with the *whole* produce of a second milking, and a cheese thus obtained is termed a two meal cheese.

The operation of cheese making commences after the morning's milking is completed. To make cheese of the best quality and of the greatest abundance, the cream should remain in the milk. Where two milkings are put together, the cream of the evening's milk is skimmed off, and the milk put into the cheese tub, reserving some proportion to be made scalding hot, one half of which is poured into the cheese tub among the cold milk, and the other into the pan where the cream is put; these being incorporated, the whole is poured into the cheese tub, where the morning's milk is put warm from the cows, when the rennet is applied in the usual manner.

3. Preparation of the Rennet.

The stomach of all animals secretes a fluid which is called the gastric juice, which possesses the property of converting milk into curd and whey. What is known therefore as rennet, is nothing more than the stomach of a calf, in which the gastric juice is preserved by a process which we are now about to detail.

Three pints or two quarts of soft water mixed with salt, wherein is put sweet briar, rose leaves and flowers, cinnamon, cloves, mace, and almost every spice and aromatic that can be procured, are to be put into two quarts of water, and made to boil gently till the liquor is reduced to three pints, and care should be taken that it is not smoaked. Strain it clear from the spices, &c. and when of the same temperature as milk taken from the cow, it is to be poured upon the bag or maw. A lemon may then be sliced into it and suffered to remain a day or two, after which, the whole should be strained again, and bottled for use; it will keep good for twelve months or more. It will smell like a perfume, and a small quantity of it will turn the milk and give the cheese a pleasing flavour. If the maw be salted and dried for a week or two near the fire, it will answer the same purpose again almost as well as before.

Throughout the whole process of preparing and preserving rennet, too much attention cannot be given to its cleanliness and sweetness, for if it be kept too long, so as to become foul or tainted, the cheese will invariably become affected by it, and will prove unfit for use. The quantity of rennet to be employed can only be ascertained by practice, but upon an average, about a third of a pint wine, measure, will be sufficient for fifty gallons of milk.

4. *The Choice of Colouring Matter.*

Spanish arnotto is unquestionably the best ingredient for colouring cheese, half an ounce of which is sufficient for half a hundred weight of cheese. The arnotto dipped in milk may be rubbed on a piece of smooth stone, and then mixed with the milk in the cheese tub, previously to applying the rennet, and should be well stirred about, so as to be thoroughly diffused through the milk.

5. *The Setting, Breaking, and Gathering the Curd.*

1. Setting of the Curd.

1. It is known from daily experience, that the warmer the milk is when the rennet is put to it, the sooner it will coagulate. It is equally well known, that the cooler the milk and the longer it is in coagulating, the more tender and delicate the curd becomes; on the contrary, if the milk be too hot, and the coagulation takes place too rapidly, the curd proves tough and harsh. But it seems to be a fact well established, that a cheese made from milk which has been coolly and slowly coagulated, is longer before it becomes marketable, than one made from milk which has undergone deliberate coagulation, and which being drier and of a harsher texture, sooner becomes cheese, and fit for the taster. Therefore the great art in this stage of the process lies in the degree of warmth of the milk when *set*; that is, when the rennet is put to it; and this can only be correctly ascertained by the use of the Thermometer. According to Marshall, from 85 to 90 deg. of heat, and a period of two hours, are the fittest for coagulation. This period, however, must vary according to the season, climate, and pasture on which the cows are fed. Milk produced from poor pastures require a higher degree of heat to affect coagulation than that obtained from richer pastures. Milk can always be brought to a proper temperature, by adding boiling water, till the thermometer indicates the requisite degree of heat for the reception of the rennet.

2. Breaking and Gathering of the Curd.

The curd is at first cut or broken in various directions with a cheese knife, to make the whey separate easily, without carrying off the richness of the curd; the broken curd is then allowed time to subside; after this, the knife is used more freely, and the unbroken curd stirred up from the bottom. The whey is then taken off with a skimming dish, the curd collected into a mass and squeezed with the back of the skimming dish; it is then cut and pressed with the hands as hard as possible, or a weight may be applied. It is after

wards distributed into two or three pans, and broken with the hands as fine as possible, and a proper quantity of salt sprinkled over it. When it is properly broken, rubbed, and salted, a cloth is spread over the cheese vat; and the broken curd being packed into it and covered up with the cloth, a board is laid over the vat, and a weight, heavy in proportion to the quantity, placed upon it, by which means the remaining whey is pressed out.

When the vats are large, a number of iron skewers are thrust through the sides, where, upon being withdrawn, they leave drains for the whey to run off. When that has almost ceased, so as to scarcely drop, the weight is taken off and the curd is re-broken, then placed again in the vat as before, and repeated with a clean cloth spread over for the purpose of receiving it, while a drop of whey can be extracted.

6. *Management of the Cheese in the Press—Manner of Salting—and Management in the Cheese-room.*

1. Management in the Press.

When the vat is placed in the press, and the weight put on, skewers are used frequently in the course of the day, as before described; after the vat has remained in the press for two or three hours, the cheese is taken out and put into warm or hot whey for an hour or two to harden its coat, it is next taken out and wiped dry, when it is again put in the vat and then into the press. Towards evening it is again taken out of the press, another clean dry cloth put on, then placed in the vat upside down, repeating this twice for two days, when it is finally removed.

2. Manner of Salting.

This is generally done during the pressing, by well rubbing the cheeses each time they are taken from the vats with salt. Large cheeses are placed into a tub where there is plenty of brine, and remain for several days; being however turned daily. The cheeses are then removed to the salting bench, and are carefully rubbed over daily with salt, for eight or ten days; at the expiration of which time they are washed in warm water or whey, dried with a cloth, placed on the drying bench, and finally removed to the cheese-house.

3. Management in the Cheese-room.

The processes of salting and drying being completed, the cheeses are smeared over with butter, and then deposited in the cheese-room, which should be both dry and airy. For the first eight or ten days the cheeses should be smartly rubbed and the butter repeated. After that period two or three times a week will be sufficient, turning them every day. To hasten the cooling and maturity of the cheese, the temperature of the room should be warm.

According to the above details excellent cheese may be made, and although the general management in all cases is very similar, yet the difference of pasturage and slight modifications in making up the respective meals, constitute the well known varieties which are held in repute by all classes of society. Of these we shall briefly notice the most popular, pointing out such details, as, by attention, will enable our readers to produce almost perfect imitations of those varieties most in consonance with their wishes :—

1. Gloucester Cheese.

There are two kinds in the market, Single and Double Gloucester; the latter made from the milk and cream, the former with milk deprived of about half the cream. The single Gloucester is the less valuable, and to distinguish it from the double it is usually marked with the impression of a heart.

The following receipt for making cheese in imitation of Double Gloucester, obtained for James Bell, Esq. of Woodhouselees, the first premium from the Highland Society of Scotland.

It is material to have good rennet made from calves' stomachs, properly cured, for curdling the milk,

The milk immediately from the cows must be put through a strainer into a tub sufficiently large to hold the quantity of milk required for the cheese intended to be made.

Put first into the milk a quantity of the finest cake arnotto, which is manufactured in London for the purpose of colouring cheese. This is done by tying it in a piece of thin muslin and immersing it in the milk, shaking it till the milk is tinged to the colour you wish your cheese to be.

Pour into the milk a sufficient quantity of rennet to coagulate or curdle it, but not more, and allow it to stand till the curd is quite formed, when it may be cut or broke with a knife, and the whey taken out with a skimming-dish. The curd must be made firmer by degrees, taking out the whey by pressing it with the hands into one side of the tub. This operation is laborious exercise for two stout dairy-maids.

After this operation, the curd is cut into pieces of about an inch square, and put into a cloth; then put into a large wooden drainer. A weight (about half an hundred) must be then laid on the top of the cover, which presses the curd moderately.

After remaining fifteen or twenty minutes, take the curd out, and cut it again into similar pieces, or rather smaller, putting it again into the drainer, and pressing it as before; take it out again in about twenty minutes, repeating the same process as before. Take it out of the drainer, and put it into a tub or vessel, and cut it as small as bird's meat, with a knife made for the purpose, having three blades, which facilitates the operation.

The curd is then salted with the best salt, and well mixed, as much as is considered necessary. It is then put into a cloth of thin gauze made for the purpose, and put into a chessil or cheese-mould, and then into the press, taking it out from time to time, and giving dry cloths, till by the pressing the cloths come off quite dry, which is the rule for knowing when it is enough pressed; but it is, perhaps, an advantage to have so many presses as to allow the cheese to remain two days or upwards. If the last cloth is of a finer texture, and dipped in warm water, wringing it before putting it on the cheese, will give it a finer skin.

It has been omitted to state, that while the curd is pressing in the drainer, it ought to be set before a good fire; and also, after putting it into the chessil, it ought to be placed there for twelve or fifteen hours, with about half an hundred weight on it, previous to putting it into the cheese-press.

The cheese, after being taken out of the press, should be laid on a tolerably dry floor, or shelves, (the former perhaps preferable), so as not to dry them hastily. They ought, in the first instance, to be turned daily and rubbed with a dry cloth. After becoming firm, their being turned and wiped twice a week will be sufficient. It is of great use to keep flies from coming near the cheese and breeding maggots, to rub the floors or shelves with elder or bourtree leaves.

The quantity of arnotto used was one cake of about one quarter of a pound weight, to ten cheeses of from twenty to twenty-two pounds each, and the quantity of salt about eight or nine ounces.

One hundred quarts of milk are found to make cheese of thirty pounds, or about three quarts to one pound of cheese.

2. Wiltshire Cheese.

It would appear that shape and size constitute the only difference between Gloucester and North Wiltshire Cheese. The following process, by Mr. Nichol, Easter House, Lanark, shire, obtained the premium of the Highland Society of Scotland, and is well worthy the attention of the reader:

"We collect two meals to one making; the evening's collection is run through a fine searce into the milk vessels, and kept over night; the cream is taken off in the morning, and the milk heated to the degree proper for warming the whole mass, which, with the cream and new milk, is run through the searce into the milk-sye (placed on a form, and the proper quantity of colouring * rennet added, (about a table-spoonful of the latter to fifty Scotch pints, when good, is sufficient.) The mass is then stirred about and well mixed, after which it is covered up, and let stand till coagulated. The dairy-maid then introduces her hand into the mass, and stirs it about slowly, till it is all broken pretty small. After standing about fifteen minutes, the edge of the tub is lifted up, and the whey run off slowly over the lip into a vessel placed below. The tub is then let down to stand a little, after which it is turned one-fourth round, and another collection emptied off. Thus, by turning the vessel a fourth round every time it is let down on the form, the curd is placed in a different position, in order to make it part with the whey more quickly.

"The process is continued till the curd has got a pretty firm consistence; it is then cut a little with a table-knife, and what little whey it then parts with emptied off, and the curd lifted into the drainer.

"This method, I find, makes the whey come off quickly, and more pure than any other mode I have seen practised. We never touch it with the hand to press out the whey, as I find that the least violence is apt to make it come off white, and so weaken the quality of the cheese.

"Being now in the drainer (a square vessel, with small holes in the bottom, with a lid to go within it) the lid is put on it, and a cloth thrown over it, after which it is allowed to stand twenty minutes. A fourth-hundredweight is then laid on, to lie twenty minutes more. It is then cut into pieces, of two inches square, with a table-knife, the lid put on, and one-half hundred weight laid on it, to lie half an hour. This process of cutting it smaller every half-hour, and adding more weight till there be a hundredweight of pressure on it, is continued for four hours after the first cutting in the drainer, when it will be ready for the chessil (cheese mould.)

"It is then put into a vessel kept for the purpose, with the proper quantity of good salt, and cut with the curd-knife very small. A clean cheese cloth, rinced through warm water

* The colouring to be rubbed in a bowl, with a little warm-water, and allowed to stand a little, and then poured off, as even the best is found to contain sand and sediment.

and wrung out, is then laid on the chessil, and the curd put into it, and a half-hundred-weight laid on it for an hour. It is then put into the press (constructed so as to hold four chessils, and the pressure augmented at pleasure), with a pressure of two hundredweight, where it stands three half-hours. It is then taken out, and another cloth, wrung through warm water, laid on the chessil, and the cheese turned upside down into it, and introduced into the press, with a little more weight applied, to stand all night. Next morning and ever after, it is changed four times a day with clean dry cloths, till it is properly pressed (which will take at least three days), the weight being always augmented till the pressure be at least a ton weight. A fine round cloth, the size of the chessil bottom, is laid in it, and the cheese put into it, and set in the press for an hour and a-half, in order to give it the proper shape.

" After the cheese is taken from the press, it is rubbed with dry salt, and turned every day for a week or ten days; after which it is rubbed with a dry cloth, and turned daily for a month longer, in order to keep it from moulding; after which, every other day will be sufficient. The cheese-room ought to be in rather a cool exposure, and I find it sometimes necessary to cover the new cheeses with a cloth, in order to keep them from cracking.

" As I am anxious to give every information in my power, I have taken a note of the temperatures at each making, immediately after mixing the rennet into it, from the 16th July to the end of August, and have sent the degree of heat at which each cheese in the sample sent for competition was made."

Date of of Making.	Number.	Description.	Heat of Milk immediately after mixing in the runnet at 10 o'clock A.M.	Temperature of the Apartment at 2 o'clock P.M.
1825.			Degrees.	Degrees.
July 16.	1	Imitation Wiltshire	95	74
...	1	... Gloucester	95	74
18.	2	... Gloucester	96	65½
20.	2	... Wiltshire	91¾	70
20.	4	... Gloucester	91¾	70
20.	3	Imitation Wiltshire, all new milk.	94 Saturday Evening 8 oclock	
22.	4	Imitation Wiltshire	92	70
22.	5	... Gloucester	92	70
25.	5	... Wiltshire	93	66
25.	7	... Gloucester	93	66
26.	6	... Wiltshire	92	67
28.	8	... Gloucester	97	67
Aug. 6.	10	.. Wiltshire	97 Made at 8 o'clock Evening.	
8.	11	... Wiltshire	94½	60

According to Mr. Sanderson, the pine-shaped cheeses made in imitation of North Wiltshire, are put into a cloth made in the shape of a filtering bag, when the curd is quite green and hung with the point down for twenty-four hours. They are then put into a net with a cloth over it, and again suspended the reverse way.

3. Chedder Cheese,

Derives its name from a vale in Somersetshire, where it is exclusively made. The cheese is of a spongy appearance, and the eyes are filled with a limpid rich oil: they usually weigh about thirty pounds each.

4. Cheshire Cheese.

Is made from the whole of the milk and cream,—the morning's milk being mixed with that of the preceding evening, previously warmed. The usual weight is about sixty pounds each.

5. Sage Cheese.

Is made by steeping one night, in a proper quantity of milk, two parts of sage, one part of marigold leaves, and a little parsley, after they have been bruised. On the following morning the *greened* milk is strained off, and mixed with about one-third of the whole quantity intended to be run or coagulated. The green and white milks are run separately, the two curds being kept apart until they be ready for vatting; these may be mixed either evenly and intimately, or irregularly and fancifully, according to the pleasure of the manufacturer. The management is the same as for common cheese. Green cheese are made in the vale of Gloucester, as as also in Wiltshire

6. **Stilton.**

May be made by the following simple process:—To the new milk of the cheese-making morning add the cream from that of the preceding evening, together with the rennet, watching the full separation of the curd, which must be removed from the whey without breaking, and placed into a sieve, until of such consistence as to bear being lifted up and placed in a hoop that will receive it without much pressure. The cheese, as it dries, will shrink up, and must therefore be placed from time to time in a tighter hoop, and turned daily, until it acquires the proper degree of consistence for use or keeping.

DOG.

Canis familiaris.

In the primitive stages of social life, when our forefathers were engaged in pastoral pursuits, we find the dog accompanying man to his daily labours, watching with careful attention the flocks, which, without such assistance, must have been restricted in limits, and consequently their propagation lessened. Punctual to his charge, the human thief, or the ravenous beast, finds in the dog an antagonist to their depredations, parting with his life, rather than betray the confidence reposed in him. Amidst distress or ill usage the affections of the dog are not alienated from his master. When indigence and want become the companions of man,—when friends, who had enjoyed his riches and affluence, retire as prosperity recedes,—the dog still remains unchanged, and appears to commiserate with the sufferings of his master.

So numerous are the varieties bred in England, that the task would be difficult to describe them, and would exceed the limits appropriated to this subject. We shall, therefore, very briefly describe those which contribute either to our pleasures or services. The most conspicuous among these are,—the Shepherds' dog, the Spaniel, the Pointer, the Setter, and the Fox-hound.

The Shepherds' Dog.

There perhaps is no animal employed in agricultural pursuits which evinces so much sagacity as this dog, or by whose services the burdens of the sheep farmer are so greatly lessened. In the northern parts of England, the shepherd's dog varies in size from those bred in the more southern districts. Their services however are the same, and it is highly pleasing to observe the care and attention he pays to his duties. The shepherd not unfrequently leaves the flock for hours to the charge of his dog, who during that time pays the greatest attention to the flock, preventing them from straggling and from receiving any injury; his master, on his return, finds him still at his duties and eager to execute his commands. These dogs employed in the farm yards or by drovers, display the same sagacity and become more fierce, owing to the nature of their employment, driving the beast and urging them forward by biting their heels; if a bye-road presents itself he runs forward, and stops in the way top revent them from straggling, constantly devoting his exertions to keeping them in the road.

For some excellent remarks on the Pointer, Setter, and Spaniel we are indebted to Loudon's Agriculture.

The pointer, setter, and spaniel, it might seem unnecessary at the first view to introduce to the notice of the agriculturist; but a little examination of the subject will show that they may be made an object of considerable importance to the farmer. Few dogs command such prices as sporting dogs; and few persons have such opportunities of rearing them so cheaply, or so well, as farmers. Many farmers shoot game; most of them do it more or less: and it would be very easy to turn two brace of pointers or setters, with one or two brace of spaniels, to pecuniary advantage without other expense than skimmed milk and potatoes, with occasionally a little barley meal. We will suppose a farm has upon it four pointers, all of acknowledged excellence, which will produce progeny between the seasons of shooting, when they are wanted; from these, four

brace of puppies may be saved, and by continually following the servants and their masters, they will become so handy, that their breaking will be effected daily, and without any other trouble than what occurs in restraining them when a little wild. If their breed is very good, their stopping and barking will commence towards the end of the first season, and during the periods between this and the next autumn, they may be steadied and practised in fetching their game, &c. as directed in good sporting works. At the commencement of the following season, if they have been well attended to, although only fifteen months old, the whole may be sold to the London or country dealers, to average six or seven guineas each; or if sold privately, they will fetch from eight to twelve and fifteen guineas each; out of which, perhaps not more than half a guinea can fairly be deducted for keep, &c. The trouble occasioned to the master will be trifling, because connected with a pleasing employment to him as a sportsman, he will thus have his own sporters for nothing. *Setters*, as more valuable, will fetch a higher price; but they do not always command so ready a sale, and are more troublesome to break.

Spaniels are commonly thought, but most erroneously, almost to break themselves. A really well bred spaniel however is so rare, that instead of its being worth two or three guineas, which is the usual price, it will fetch from five to ten pounds. It would be even less difficult to the farmer to rear spaniels than pointers; and by following him continually about the grounds, they may be taught to perfect obedience, and close rangings, which are the grand requisites, without trouble or expence. In this way, four or five brace might be easily brought every season to market, and would always command a ready sale, and a price according to the perfection of their breaking.

In the breeding and rearing dogs for the above purposes, it is necessary to observe the greatest care in their original selection; that the breed be of the very best, and one which as it were breaks itself, for this shows the purity of the breed. It is likewise no less necessary that the breed be carefully preserved so; to effect which the sexes at the proper season should be kept together in a place of confinement for a fortnight. It is likewise almost equally necessary, that the dogs peculiarly appropriated to agriculturists, particularly the shepherd's dog, should be bred as pure as possible, for no animal is more likely to sport into varieties. No crossing can on any account be permitted; but choice may be made among families of the same variety. In the rearing of this dog, his educatfon should be carefully attended to, to make him hardy, and familiar with all the signs of the shepherd, who ought himself to be equal to the regular education of his dog.

The following observations on the breeding of fox-hounds are the result of the experience of a gentleman, who has devoted much time to the amusement of fox-hunting.

The Fox-hound.

"In breeding hounds much judgment is required, and the rule to breed from hounds with *good noses*, like the law of the Medes and Persians, which varieth not, should never be departed from. It is also necessary to avoid too great a partiality to one's own sort, and to hounds, whose good qualities may incline us to overlook their faults; for it is best not to breed from hounds possessing any defects of make and shape, or who have any glaring or incorrigible tricks, (unless you know their sort to be superior, and in general faultless: for it sometimes happens that a bitch, good for nothing herself, may breed an excellent litter, but, then, she must be well bred herself). The great and most common vices in hounds are, throwing their tongues to cry, when there is no scent, skirling, and running mute. The perfection of make and shape consists in the neck being long, the head not too large, the shoulders lying back, the chest full and deep, loins powerful, legs straight, the feet small and like those of a cat; and the hound should stand over a great deal of ground. I consider *bone* to be a *sine qua non* to a certain degree, but I differ from some judges of these matters, who consider the bone of a fox-hound should necessarily be as big as *that* of a Newfoundland dog, having been always of opinion, that the perfect symmetry and proportion of all parts constitute strength in a hound, provided there is outline and size enough to admit of power.

It is impossible to breed a packof fox-hounds to a state of perfection, without having the command of numerous walks (and greatly obliged is every master of fox-hounds to those friends who will undertake to bring up a puppy for him); for you must breed largely, in order to have the power of selecting those whose shapes are good. And on the subject of walks, it is not sufficient that a person shall take a puppy, and think he is doing a service by only half feeding him, or by shutting him up, and not letting him have his liberty: the invariable consequence of tying up any hound in his growing state will be to make him

crooked legged, and to turn his toes out; and the keeping him on a short allowance, or a bad food, will stint his growth, which holds good with all animals. A puppy born in July, and kept well, having his liberty at a walk will be of a greater size than one born in the preceding February without these advantages. The best period for putting the bitches to the stallion hounds, is, from January or Christmas to the beginning of April; and youth should be on one side invariably: and I consider it more especially required on the part of the bitch, yet no bitch should be bred from under two years old.

The number of puppies to be saved in each litter must depend on the milk, or powers of nursing in the mother: but four should be the greatest number ever attempted to be brought up by one bitch. You may put some of the same litter to another bitch, if anxious to preserve the sort. When the puppies are weaned, which may be at two months old, they should be fed chiefly on milk, and may go to their walks, where, as has been said before, they must have their liberty, and they should not be brought into the kennel until they are twelve months old.

We will here leave them, as the description of kennel discipline, and of breaking them to their work in the field subsequently, would embrace a wider range, and would occupy a larger space, than can be spared in this volume." C. C.

Ringmer, May 3rd, 1830.

DISEASES OF DOGS.

The dog is liable to so many diseases, that to attempt to treat of the whole of them, however briefly, would far exceed the limits assigned us; the more common diseases however, as the distemper, mange, sore feet, strains, and bruises, may be briefly noticed.

DISTEMPER.

For the following important information on the treatment of the distemper of Dogs, we are indebted to Mr. Youatt's interesting paper, read at the Veterinary Medical Society, January 14, 1830.

The distember is clearly a disease of the mucous membranes, usually commencing in the membrane of the nose, and resembling nasal catarrh. In the early stage it is *coryza*, or nasal catarrh, but the affection rapidly extends, and seems to attack the mucous membranes generally —determined to some particular one, either by atmospheric influence or accidental cause, or constitutional predisposition. The fits arise from general disturbance of the system, or from the proximity of the brain to the early seat of inflammation.

We may be assured that there is and can be no specific in a disease like distemper. The circumstance most connected with our success will be the recollection that it is a disease of the mucous surfaces, and that we must not carry the depleting and lowering system too far. Keeping this in view, we must accommodate ourselves to the symptoms as they arise.

In distemper, whatever be the form which it assumes, an emetic is the first thing to be given. Common salt will do when nothing else is at hand; but the best emetic, and particularly in distemper, consists of equal parts of calomel and emetic tartar; from half a grain to a grain and a half of each will constitute the dose. This will act first as an emetic, and afterwards as a gentle purgative. Then, if the cough be urgent, and there be heaving at the flanks, and the nose be hot, a moderate quantity of blood may be taken; from three to twelve ounces; and this, if there has been previous constipation, may be followed by a dose of sulphate of magnesia, from two to six drachms. In slight cases this will often be sufficient to effect a cure.

If the dog still droops, and particularly if there be much huskiness, begin to give antimonial or James's powder, nitre, and digitalis, in the proportions of from half to one grain of digitalis, from two to five grains of the James's powder, and from a scruple to a drachm of nitre, twice or thrice in a day; except that on the third or fourth day, if the huskiness be not quite removed, the emetic should be repeated.

In these affections of the mucous membranes it is absolutely necessary to avoid or to get rid of every source of irritation, and there will generally be found one, and a very considerable one in young dogs, worms.* If we can speedily get rid of them, distemper will often rapidly disappear; but if they are suffered to remain, diarrhœa or fits may supervene; therefore some worm medicine should be administered.

I have said that vomiting is very easily excited in the dog; and on that account we are

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* The intestines of a puppy which had died of distemper were here examined, and found to be almost filled with worms.

precluded from the use of a great many medicines in our treatment of him. Calomel, aloes, jalap, scammony, and gamboge, will generally produce sickness. We are, therefore, driven to some mechanical vermifuge; and a very effectual one, and what will rarely fail of expelling even the tape-worm, is tin-filings or powdered glass. From half a drachm to a drachm of either may be advantageously given twice in the day. I generally add them to the digitalis, James's powder, and nitre, made into balls with palm oil and a little linseed meal. This course I would pursue in usual cases until two or three emetics had been given, and a ball morning and night on the intermediate days.

This is the only febrile stage of distemper, if much fever ever accompanies it. Should the huskiness after the first two or three days not diminish, and the dog not rapidly lose flesh, I should be disposed to take a little more blood, and to put a seton in the poll; but I would use the proper seton needle, and not the barbarous red-hot iron of the farrier. It should be inserted between the ears, including as much of the integument as possible, and, indeed, reaching from ear to ear. When there is fever and huskiness, and the dog is not much emaciated, a seton is an excellent remedy; but if it be used indiscriminately, and when the animal is already losing ground as fast as he can, and is violently purging, you will only hasten his doom, or, rather, make it more sure.

It is now, if ever, that pneumonia will be perceived. The symptoms of inflammation in the lungs of the dog can scarcely be mistaken. The quick and laborious breathing, the disinclination or inability to lie down, the elevated position of the head, and the projection of the muzzle, will clearly mark it. More blood must be subtracted, a seton inserted, the bowels opened with Epsom salts, and the digitalis, nitre, and James's powder given more frequently, and in larger doses.

Little aid is to be derived from observation of the pulse of the dog, it varies so much with the breed, and size, and age of the animal. I confess that many years' practice have failed in enabling me to draw any certain conclusions from it. The best place to feel the pulse is at the side. One very important information we may possibly gain from it, viz., whether digitalis is producing an intermittent pulse, which it frequently will do, and which we wish that it should. The digitalis should then be given a little more cautiously. and in smaller quantities.

If the pneumonia be conquered, or we have proceeded so far without any considerable inflammatory affection of the chest, we must now begin to change our plan of treatment. If the huskiness continues, and the discharge from the nose is increased and thicker, and the animal is losing flesh and getting weak, we must give half the quantity of the sedative and diuretic medicine, and add some mild tonic, as gentian, chamomile, and ginger; with occasional emetics; and take care to keep the bowels in a lax but not purging state. The dog should likewise be urged to eat; and if he obstinately refuse all food, he should be forced with strong beef jelly, for a very great degree of debility will now frequently ensue.

We have thus far considered the treatment of distemper from its commencement; but it may have existed several days before we are consulted, and the dog may be thin, and husk, and scarcely eat. In such case give an emetic, a dose of salts, and then proceed to the tonic and fever balls.

Should the strength of the animal continue to decline, and the discharge from the nose become purulent and offensive, the fever medicine must be omitted, and the tonic balls, with carbonate of iron, administered.

If the dicharge from the nose becomes very offensive, and the lips swelled and ulcerated and the breath fœtid, an ounce of yeast may be administered every noon, and the tonics morning and night; while the mouth is frequently washed with a solution of chloride of lime.

At this period of the disease the submaxillary glands are sometimes very much enlarged, and a tumour or abscess is formed, which, if not timely opened, breaks, and a ragged ill-conditioned ulcer is formed, very liable to spread, and very difficult to heal. It is prudent to puncture this tumour as soon as it begins to point, for it will never disperse. After the opening, a poultice should be applied one day to cleanse the ulcer, and it should then be daily washed with the compound tincture of Benjamin, and dressed with calamine ointment. Tonic balls should be given, and the animal liberally fed.

Should fits appear in an early stage, give a strong emetic; then bleed, and open the bowels with six grains of calomel and a quarter of a grain of opium; insert a seton, and afwards give the tonic balls.

The progress of fits, in the early stage of the disease, may be sometimes arrested. Two or three should not make us despair; but if they occur at a later period, and when the dog is much reduced, there is little hope; for this additional expenditure of animal power will soon carry him off. All that is to be done, is to administer a strong emetic, obviate costiveness by castor oil, and give the tonic balls with opium.

In fits, and indeed in every period of the disease, the animal should be kindly treated. Rough brutal usage will often bring on fits, and coaxing and kindness, even without medicinal aid, will sometimes put an end to them. At the moment of the fit, and especially if the dog is dangerous and will not be fondled, a cup of cold water dashed violently in his muzzle will frequently have an instantaneous and almost magical effect. The dog starts, looks eagerly around him, and is himself.

Of the treatment of the yellow disease I can say little. I have not succeeded in one case in twenty. When good effect has been produced, it has been by one large bleeding, opening the bowels well with Epsom Salts, and then giving grain doses of calomel twice a day in a tonic ball.

While it is prudent to obviate costiveness, there is nothing more to be dreaded, in every stage of distemper, than diarrhœa. This shews the folly of giving violent cathartics in distemper; and when I hear of the ten, and twenty and thirty grains of calomel that are sometimes given, I think it very fortunate that the stomach of the dog is so irritable. The greater part of these kill or cure doses is ejected, otherwise the patient would soon be carried off by superpurgation. There is an irritability about the whole of the mucous membrance that may be easily excited, but cannot be so readily allayed ; and, therefore, excepting the earliest stage of distemper, or in fits, or the small portion of calomel which enters into our emetic, I would never give a stronger purgative than castor oil or Epsom salts. It is of the utmost consequence that the purging of distemper should be checked as soon possible. In some diseases a sudden purging, and even one of considerable violence, constitutes what is called the crisis. It is hailed as a favourable symptom, and from that moment the animal begins to recover ; but this is never the case in distemper ; it is a morbid action, and, must sooner than we are aware, produces a dangerous degree of debility.

The proper treatment of distemper-purging is first to give a good dose of Epsom salts, to carry off any thing that may offend, and then to ply the animal with mingled absorbents and astringents. A scruple of powdered chalk, ten grains of catechu, and five of ginger, with a quarter of a grain of opium, made into a ball with palm oil, may be given to a middle sized dog twice or thrice every day. To this may be added injections of gruel, with the compound chalk mixture with opinm.

Of preventives I have little to say. Good feeding is the best preventive. A growing dog, and until he has has had the distemper, should have nearly as much as he will eat. The distemper will try the strength of the best conditioned animal, and a half starved whelp is sure to perish.

MANGE, (Common Red.)

RECIPE.

Sulphur Vivum - - - - - - - - - - -	Four Ounces.
Hellebore Powder - - - - - - - - - -	Two Ounces.
Bay-berry Powder - - - - - - - - - -	Two Ounces.
Spirits of Turpentine - - - - - - - - -	One Ounce.
Hogs' lard (to form it into an ointment) - -	Half a Pound.

The dog to be first washed with lime water; and when dry to be well rubbed with some of the ointment on the parts affected. The washing and dressing to be repeated every two days.

Give the dog half a dram of nitre and a dram of sulphur daily, for ten days. It will be best to keep the dog free from getting very cold or wet during this process, which very rarely fails to cure in two or three applications.

Sore Feet.

To keep a dog's feet hard and sound, the best way is to wash them with brine, *every day after coming in ;* because, if once suffered to get raw, they are so apt to smart (particularly if any thing is applied), that the dogs gnaw and bite them to allay the itching, which of course makes them worse.

If any farther remedy is required, the following application may be used :—

Oil of Vitriol - - - -	Five drops.
Tincture of Myrrh - -	One ounce.

A little of which should be applied with a feather, after first washing the feet.

Strains or Bruises.

"I have always found," says Col. Hawker, "that an immediate and long-continued application of water, *as hot as it possibly can be borne*, is, in these cases, the best fomentation that can be applied. After this, rags wet with the following lotion may be employed :—

Acetated Lead - - - - -	Two ounces.
Vinegar - - - - - - - -	One pint.

Mixed together.

The following recipe is given by Colonel Hawker, who states that it has succeeded far better than any other remedy he ever tried :—

Opium - - -	Three Grains.
Emetic Tartar -	Five Grains.

When the inflammation is completely removed, rub the parts with the following embrocation:—

Soft Soap - - - - -	One ounce.	Oil of Turpentine - -	One ounce
Spirit of Wine - - -	Ditto.	Green Elder Ointment -	Two ounces.

To physic moderately, and give a fine Coat to Dogs.

Take a handful of the leaves of wood laurel; boil it in a quart of water till reduced to a pint, and mix it with sufficient liquid food to serve five or six days. This should be given about once a month, in hot weather; but as the wood-laurel is poisonous when taken in large quantities, it must be used with the greatest caution.

If a sportsman had his pointers *rubbed down and brushed* every day, immediately after they come home, and particularly if wet or cold, they would not only have fine coats, but be serviceable to him at least half as long again.—*Hawker's Instructions to Sportsmen.*

DRAINING.

By Mr. J. P. Hilder.

Draining is the art of removing the superabundant water from the surfaceof the earth,which by a multiplicity of causes is conveyed there:

Moisture, unquestionably, is highly necessary to vegetation ; but an excess retards, and even destroys it, as, for instance, in swampy situations. Tillage is useless, unless the land be laid dry from all springs, which can only be effectually performed by under-draining:

1. *Origin of Springs.*

The water which falls upon the surface of the earth in rain, snow, &c., penetrates its substance till it meets with a stratum of clay, stone, or some other substance which stops its descent ; it then glides laterally on the stratum which sustains it, till meeting with an aperture, it appears on the surface of the earth in the form of a spring or excessive moisture. Elevated situations are reservoirs, from whence all springs arise ; if in the internal structure, the stratum of earth where it is stopped is regular, the water will not break out or show itself until it has reached the levels, which may be at a considerable distance ; but where the stratum is broken, the spring not unfrequently bursts at the sides. Springs are always below the spot from whence they are supplied.

2. *General principles of Draining.*

It is evident from what has been already stated, that no soils would require draining were they not intercepted by strata of clay, or other impervious materials. As the resistance afforded by this strata is the cause of stagnant water, its removal can only be effected by penetrating through this impervious strata by means of drains, whereby the top or stagnant water may be completely removed, and the land rendered in a fit state for cultivation.

In carrying this operation into effect, the great object to be considered, is not the removal of the top-water produced by rains, &c., but, to prevent the under or spring water, from rising and stagnating on the surface, to the prejudice of the land, but, this can only be effectually accomplished by cutting the drains at least three feet and a half or four feet deep. We are fully aware that this practice is at variance with the prevailing opinions upon this subject, yet experience warrants us in recommending these greater depths, which we have so successfully practiced for a number of years.

The opinion of admitting the surface water to the drain, by filling it up with stone or other porous materials, is altogether erroneous, for we have in several instances, even, on the stiffest and most sterile clays, proved that it was impossible to keep it out. Our object is to evacuate that water, from below, at a sufficient depth, which is thrown up by, and becomes stagnated on the clay or other impervious soil, by this means we take the water that would otherwise rise and supply the soil above the orifice, which keeps it in its adhesive state, it then soon shrinks and cleaves in every direction, and thus admits freely the passage of the top-water to the surface drain.

Although, we feel satisfied that the above theory must be evident to all, who will take the pains to investigate the subject, still, we are desirous of adding another remark in elucidation.

In noticing, during a very dry season, which soils are the most cleft, we shall invariably find these to be the clays, and why? from their retentive nature they retain a greater quantity of water than the more porous soils ; the excess of water therefore accumulated during the winter months being now taken away from them by evaporation, they of course lose more in bulk, and consequently fissures are formed in every direction,

In draining marshes or low lands, a practice somewhat different must be adopted, for in most cases springs on such lands rise from a greater depth, the immediate pressure of the adjacent higher grounds, causing them to flow to the surface, they are consequently, unconnected with any strata, that can be cut by the drain, which makes the use of the Augur indispensable to effect a perfect drainage of lands of this description.

Large quantities of water are frequently found oozing out on the sides of hills caused by the jutting out of the rocks and in cutting the drain, it sometimes happen, that it does not take the water according to our expectations, not being sufficiently deep, to cut off the main supply, but it passes under it and rises again, within a few feet of the drain on the lower side, in this instance it is frequently attended with great uncertainty

The boring is conducted after the manner in which they bore for pit coal, with an Augur from two and a half to three inches in diameter; is worked by two men, who, after they have worked in the piece of iron attached to the augur, fix on another, and continue until they have reached the bed of the stream, or a sufficient depth to suit their purpose. The borer is about an inch in diameter,—each man has a bar of iron, which are fixed on to the borer, affording a handle to assist in boring This practice was first suggested by Dr. Anderson, and since practised with great benefit. Not unfrequently sand and other loose matter will rise in the bore, and unless cleared choke it up; to prevent which, pipes are sometimes let down.

3. *Springs so deep below as not to be reached by the augur.*

The above practice is not always efficient, as there are, though rarely found, situations where the uppermost stratum is so extremely thick as not to be easily penetrated, or where the springs formed by the water passing from the higher grounds may be confined beneath the third and fourth strata of the materials which form the declivities of hills or elevated grounds, on account of so many of them becoming deficient on their tops or more elevated parts, and by this means lie too deep to be penetrated by cutting of a ditch or even by boring; and still, from the water being obstructed by the different materials forming the plains below, may be forced up to the surface, and produce different kinds of injurious wetness.

In such cases, the common mode of cutting a great number of drains to the depth of five six, or more feet, across the wet morassy grounds, and afterwards covering them in such a manner as that the water may suffer no interuption in passing away through them, may be practised with advantage, as much of the prejudicial excess of moisture may by this means be collected and carried away, though not so completely as cutting off the spring.

4. *Wet-bottomed Lands.*

Lands which are, as the farmers term them, *wet-bottomed*, that is, have the top soil of a light porous nature to the depth of two or three feet, and below which there is a stratum of clay, or other mineral, preventing the water from filtrating, are much injured by the water stagnating, and may be remedied by a few drains, made according to the situation and extent of the field, of such a depth as to allow the water to pass under the clay. In these instances boring will not be useful, as the water does not originate from a spring.

5. *Land with surface of stiff clay.*

The same system will effectually drain the land, here alluded to, the drains should be put under the clay, and if much water is found, it will force itself into the rivulet or open ditch at the end of the field, and require but little attention. The reason why people entertain an idea, that drains must be narrowly watched and looked after, is, because they are too generally put in at a shallow depth, and take a little of the top water after a heavy fall of rain, these afterwards becoming dry, get stopped up in various ways at the ends with rubbish. Drains are sometimes, however, stopped by moles, vermin, worms, and the opening of the ground by drought principally from under water, which is invariably found more on stiff adhesive soils than elsewhere.

6. *Construction of drains.*

All drains, as regards their formation, are of two kinds; —those cut perpendicularly for the purpose of forming an arch or conduit, and those cut in the form of a wedge. The former are only made use of where a stone arch is required or where a greater depth is desirable, than the tools for making the wedge-form drain can be made to cut, the whole of the earth, being taken out of those drains by the labourers standing on the surface.

The latter are unquestionably, the best and cheapest drains for all purposes excepting the above, the quantity of earth moved in forming them, being so extremely small. Seven inches is the general width for the top of a drain of this description, which is generally about 3½ or 4 feet deep, the bottom never exceeding 1½ or 2 inches, where turf or sod is used; if tile, the bottom should be cut as near the width of the tile as possible. A pair of wooden pincers will be necessary to enable the labourer to place the tiles properly in the drain, as the narrowness and depth of the drain, will prevent his doing it in any other way, a little litter or fine bushwood should be placed on the tiles, the earth should then be put in and rammed firmly to the top. When turf is used, it should be so cut, placing it with the sod downwards, as to make it impossible to drive it by the rammer nearer than from 6 to 7 inches from the bottom, it should be well rammed and the earth thrown in by degrees.

The stone drain is from the quantity of earth required to be moved much more expensive, and is only necessary where there are considerable bogs, great depths of peat, or quick running sands. In cases of bogs or peats, stone is the best and most safe, if sand, tiles doubled the one over the other, or one laid on the back and covered with a flat tile. The width of these drains will of course vary with the depth or the width required at the bottom for the tile or stone. If stone be used it should not be broken small, and thrown in losely, but set so as to form a small arched conduit, about five or six inches high and three or four wide. A thin layer of small stone should be placed on it with a little litter of any description, to prevent the earth from getting in. The earth should then be thrown in, ramming it to the top.

With a very few exceptions meadow or pasture land may be drained with sod, if it be sufficiently firm and well rooted, which will be found quite as permanent as well as much the most economical mode.

In very strong and adhesive clays, when the land is under the flow, drains may be formed of the clay above, exactly on the same principle as the turf drains, a wad or wedge of clay being used instead of sod. Take a piece of wood about six or eight feet in length, shaping it to the bottom of the drain round on the lower side, and the same at the top, increasing in width with the wedge like form of the drain, and about five inches deep, place it at the bottom of the drain and ram the clay firmly on it, moving it forward as it may require, taking care to have one or two feet back in the drain so rammed, which will prevent any impediment being formed by the clay whilst ramming, leaving the drain in a regular aud perfect state.

We have only mentioned turf, tiles, and stones, as materials for filling up drains, but there are others used as may best suit the convenience of the drainer. Wood of different descriptions, cut poles, brush wood, heath, straw, &c.

Conclusion.

It would seem evident, that springs of such kinds as can be in any material degree detrimental to land, need never to be apprehended where there is a great depth of porous materials, such as sand or gravel, without the intervention of clayey or impervious strata; or in the contrary situation, as where the clayey, marley, or other sterile body, extends to a considerable depth. This should constantly be kept in mind by the drainer; and that where the mischief proceeds from superficial wetness caused by the stiff retentive nature of the soils, there must be particular attention paid to the nature and position of the land, the direction, cutting, and mode of filling the superficial hollow drains employed in such cases.

On spots beneath which springs exist, coarse sour herbage generally grows, and during a summer evening, mists will be first seen to rise.

DRILL HUSBANDRY.

Drilling (so called from the original machine for depositing corn in rows, being a circular revolving box with small holes drilled in it) by one of those seemingly-strange revolutions in human affairs now styled the "New Husbandry," is in reality the primitive practice, and derived from the most remote antiquity. There needs no better proof of this than the existing practice of various eastern nations, where, it is well known, they have ever retained the customs of their ancestors with the most superstitious veneration, and where, according to the most authentic records, no change has occurred in their system of agriculture for thousands of years. In Arabia, China, and Japan, they both drill and dibble their corn, and in three points the most important in the whole range of the husbandman's art, they are, at least a century before us; they cultivate their whole country even to the summit of the hills, they collect with unremitting attention every article of manure, and they suffer not the existence of a weed. The Belgic districts, on our own continent, justly boast a similar superiority over us.

The drill husbandry has been probably known and practised by individuals of this country for ages, but was first attempted on a regular and permanent plan, about the commencement of the last century, by Jethro Tull, who professed to have caught the idea from the vine-culture on the continent, and to whose ingenious mind the mechanism of an organ suggested the rudiments of an implement for the delivery of seed into furrows or drills. Most of our drilling and hoeing instruments are either copies of, or improvements upon the invention of Tull. It would be extremely wrong to consider the penury and distress to which Tull was eventually reduced as an argument against his system; we know too well. from experience at the present time, that money may be sown broadcast upon the ground as well as drilled, without remuneration. To those unacquainted with the proverbial aversion of the generality of English farmers to all improvements, and their rejection of the most obvious benefits merely on account of their novelty, the slow progress of the drill-culture on lands particularly calculated for it, with its perfections staring them in the face, appears most extraordinary. In the usual broadcast system the ground occupied by weeds and fallows would supply a large part of our population with bread and meat. Some of the lands in the Weald of Sussex are undoubtedly too wet and

tenacious for the drilling of wheat, but there are but few pieces where the drill might not be used to advantage for spring corn; and for the wheat, the dibble and manual labour might be profitably employed, instead of the drill, the seed saved more than compensating for the extra labour, and the extra labour tending to reduce the poor rates, already pressing so heavily on the farmer. The grand objection to the drill husbandry, on clay lands, has been the difficulty of sufficiently pulverizing them, and yet upon clay lands of all others it would be most advantageous, from the benefits they would receive from the operations of the horse-hoe in the attainment of the great object, friability; by which they are rendered the most powerfully-productive of all lands. This kind of land, however, must always be tilled at the greatest expence; at least, although it is seldom above half tilled, great strength is always maintained upon a clay farm on that pretence. A part of this strength generally misapplied, and ineffectually employed, in a perpetually turning over of immense and solid clods by the plough, which would pay much better by being attached to the scarifier and horse hoe. This stubborn earth, from constant pulverization, would in time submit, become friable, and almost change its nature to a dark, crumbling, and fruitful loam. It is known, although not so generally as its importance demands, that the most sour, harsh, and unfruitful subsoil, by dint of exposure to the atmosphere, and by the aid of frequent pulverization, will become proportionably good and fruitful land; what then may not be expected by continually working good strong clay, draining it, and at the same time rendering it pervious to the enriching dews, which would otherwise soon be exhaled from its hardened surface? The operations of the plough immediately previous to the frosts of winter will afford great assistance to the working of such land in the spring, and, moreover, not even manure affords so great and *immediate* strength to clay lands as a winter's frost; hence the maxim of leaving lands unploughed until the spring, that a more ready access may be obtained to them at that time, is more than counterbalanced by the loss sustained of the renovating influence of the frost.

Many unsuccessful attempts at drilling have arisen, either from an improper beginning, with a soil full of couch-grass and perennial weeds, under the vain expectation of eradicating them with the hoe; or from an almost total neglect of the hoe after the first attempt, and when the novelty of the work has worn away. Land intended for drilling should be first thoroughly cleaned from rubbish, and in a pulverised state, the hoe will then preserve this desirable condition. Sir John Sinclair, in his Code of Agriculture, has however so ably treated ton the drilling system, that we cannot do better than make the following extract from that excellent publication:—

Drilling Leguminous Crops.

There is no question, that the culture in rows is best calculated for them, because—1. It carries off the extra moisture in wet soils; 2. It exposes more surface to atmospheric influence, by which the soil is ameliorated; and, 3. It gives an additional opportunity for the vegetation and the destruction of weeds.

" Beans should be drilled not only on loamy soils, but even on strong and rich clays. When drilled, from the manner in which the plants grow, the pods are placed on the stem, from the root upwards, and of course must derive essential benefit when filling, by the admission of air through the open space left between the drills. The soil is likewise meliorated by the hoeing, and the weeds are destroyed.

Drilling for turnips is likewise greatly to be preferred. The superior facility afforded by the drill culture of simplifying and expediting hand-labour,—the advantages of applying recent and moist manure directly to the seed,—the more regular and correct adjustment of the number of plants to be left on a given space,—and the more equal admission and circulation of air among the plants, entitle the drill system to a decided preference.*

Potatoes, also, ought to be planted in rows by all farmers, whatever plan gardeners or cottagers, on small patches, may adopt. There ought to be a distance of from twenty to thirty inches between each row, so that the fibres which nourish the plants may not be disturbed by the hoeing, for if they are injured, the stems will be puny and the bulbs few and small.† There is a striking difference found, in the same field, between a part that had been drilled and a part that had been dibbled, in an experiment made to ascertain the advantages of each mode of culture.—*Phytologia*, p. 441.

The drilling of carrots has not been found to answer in Suffolk; but it has succeeded, in the experience of Mr. Butterworth and others, in Scotland; and this useful plant can thus be cultivated with profit, on soils where otherwise it would hardly be practicable;—the drills furnishing an artificial depth of soil in which this root can be raised. Fourteen inches between the rows is recommended as the proper distance.—*Amos on Drill Husbandry*, p. 190.

In regard to peas, when sown with a mixture of beans, drilling is to be preferred to the broad-cast system; though the hoeing is attended with difficulty, owing to the plant falling so early down upon the surface; the rows ought to be from twenty to twenty-seven inches asunder, and the intervals repeatedly hand-hoed. Any weeds that may grow among the peas, may be pulled up by hand. It has been found that peas, properly drilled, and carefully hoed, were at harvest, nearly as clean as the beds of a garden, and the produce of both grain and

* The drills of potatoes are, in general, much too close.

† At the same time, in dry soils and seasons, this has not answered, unless done early.

haulm quite satisfactory: whereas the headlands, which had been sown broad-cast, had a miserable crop of grain, thinly scattered among a multitude of annual weeds, and scarcely worth reaping.—*General Report of Scotland*, vol. i. p. 529.

As to tares, they are sometimes drilled, particularly when sown in spring (*Kent Report*, p. 107; but the broad-cast is the more general practice when sown in autumn. When drilled, the rows should be fifteen inches apart. In strong tenacious clays this crop, when repeatedly hand-hoed, is said, in dry seasons, to be more profitable than beans.—*Communication from John Middleton, Esq.*

Drilling Culmiferous Crops, or the Row Culture for Crops of Grain.

There are various modes of placing grain in rows, not only by a drill-machine, but by the drill-barrow,—the drill-roller,—the drill-harrow,—the drill-scarifier, &c.; but the drill-machine, *properly so called*, is so much more in use than all the others put together, that it is unnecessary, *in a general work* like the present, to enter into a discussion of these local practices.

The question, whether it is most expedient and profitable to raise culmiferous crops according to the broad-cast, or drill-system, has agitated the agricultural world for several years; and as it is a point respecting which there still exists a great diversity of opinion, it may be proper here to detail the arguments on both sides, and to state what seems to be the result of a number of experiments tried in various districts.

The arguments against drilling are 1. That the machinery is expensive at first, and afterwards not easily kept in order.—2. That the process cannot be carried on by common labourers, being both difficult and minute. (This objection has been thus obviated:—Mr. John Johnson has trained his labourers to attend his drills. When hired by his neighbours, he charges only 15*d.* per acre for sowing, and 1*s.* per acre for horse-hoeing, finding horses, implements, and labourers. (*Derbyshire Report*, vol. ii. p. 95.)—The drill-barrow is also so simple a machine, that even a boy may use it.—3. That it requires more time to carry on the seed process, and consequently is not calculated for districts where the climate is unfavourable.—4. That it is not adapted for gravelly or stony soils (*Gloucester Report*, p. 111); nor for undulated districts, where the land is steep.—5. That it cannot be of much utility in effecting the destruction of root-weeds.—6. That the plants of grain crops seek for nourishment more by spreading, than by penetrating to a great depth; and that it is injurious to such plants to be matted together in rows, and placed in their earliest infancy in a state of conflict with each other (*Marshall's Southern Counties*, vol. ii p. 20.) This author remarks, that the roots of pulse, particularly that of beans, strike downwards with a strong tap, and throw out a few strait lateral shoots horizontally, *at different depths*, and does not form a mat of fibres near the surface, as the gramineous tribe of flowers (*Ditto*, p 22.).—7. That either much ground is unoccupied, or, if filled by tillering from the rows, the produce is of inferior quality.—8. That white crops have no occasion for the admission of air to the bottom of the stalk to each plant, which pulse crops require; on the contrary, that the crop should completely cover and occupy the whole ground.—9 That the harvest is later, and the corn less equally ripe on drilled fields, than in those which are sown broad-cast.—10. That if all crops were to be drilled, it would require treble the present number of labourers to perform the operation of hoeing them [*Kent Report*, p 96.)—11. That when the land is sown with clover between the rows, no hoeing can be carried on afterwards.—12. That the produce of the best drilled crops does not exceed, if it even equals, that of the best broad-cast. (Two eminent farmers in East Lothian, who cultivate on a great scale, were examined before the two houses of parliament, anno 1806, and gave evidence—1, Mr. Turnbull, that his average produce of wheat was fifty-two bushels per Scotch, or forty-one and a half per English acre; and Mr. Brodie, of Scoughall, that his average produce was not less than fifty-six bushels per Scotch, or forty-five per English acre, both ascertained by their sale-books)—And, 13. That though in poor soils, considering their want of natural fertility, large crops of grain may be obtained, yet, in rich soils, hoeing is apt to throw the vigour of the soil into the stems of the foliage, instead of the fruit: hence, though the straw may be strong and abundant, the grain is often defective in quality, or greatly diminished in quantity. Such a circumstance, it is said, has often terminated the career of the drillist, and accounts for the numbers who, after trying it for several years with seeming success, were ultimately obliged to abandon the practice.—*Marshall's Southern Counties*, vol ii. p. 18.

The introduction of the drill system, is by others, considered to be the most important of modern improvements, and is defended on the following grounds:—1. That the broad-cast system is a less perfect and a less economical mode of cultivation than that of drilling, for the seed can neither be deposited in the soil with the same exactness in regard to depth, regularity, or proportion, nor be so placed, that the crop can afterwards be improved in its progress to maturity (*Dickson's Husbandry*, vol i p 156).—2. That in light soils, it has the important advantage of giving the grain a good hold of the ground, and of giving all the seed the same hold,—(this is not an advantage peculiar to drilling, for when crops are ploughed in, they have the same hold of the ground)—which prevents the frost from throwing

but the plants in spring, or the wind from loosening the roots, after the stem gets high, or when the ear is filling.—3. That it gives an opportunity for cleansing the ground, and completely extirpating annual weeds.—4. That if the land is not hoed, but hand-weeded, less damage will be done to the crop, by the weeder's feet passing between the rows of plants, than by treading upon them, as must inevitably be the case when standing promiscuously over the ground.—5. That the progress of the grain, after the cultivator has opened the land, is quite surprising, even in a wet district, but that in dryer climates it must be still more beneficial (*Communication from J. C. Curwen, Esq. M. P.*)—6. That it is peculiarly calculated for inferior soils, and brings their produce more nearly on a footing with that on fertile land than could otherwise be obtained (Mr. Blakie, of Holkham, states, that it is no uncommon circumstance to have, from inferior land in Norfolk, rented only at from fifteen to thirty shillings per acre, as much produce as from land that in other districts pays from five to six pounds per acre. From land of an inferior quality, paying only twenty shillings for rent and five shillings for tithes, forty-one bushels of wheat per acre have been obtained).—7. That the pulverization of the soil between the rows of autumn or winter sown wheat is of the greatest benefit to the clover seeds sown in spring, and that the admission of air between the rows is of use to the grass-seeds in their growth.—8. That drilled crops of white corn are less apt to lodge, or to be beaten down in wet seasons.—And, 9. That the expence of cutting a drilled crop in harvest is uniformly less than of one which is sown broad-cast, since three reapers will do as much work in the former case as four in the latter (*Husbandry of Scotland*, vol. i. p. 347.) In regard to any saving of seed, which by some is considered an advantage, Mr. Coke, of Holkham, is decidedly of opinion, that such an idea is founded on erroneous principles, and that any saving of that sort ought not to be attempted.

Innumerable instances might be brought forward of heavy crops having been produced under the drill system, by those who have bestowed much care in trying the experiment; and it has often answered, even on a great scale, when properly executed. But its success must depend upon the intelligence, attention, perseverance, and means of the farmer.

" As it has been carried to the highest perfection, and cultivated to the greatest extent, on the farm and on the estates of that distinguished agriculturist, Mr. Coke of Holkham, it may be proper to give a short account of his practice. He used the Rev. Mr. Cook's drill, which sows six rows at a time, and an acre in an hour, drawn by a single horse. His wheat he sows at nine inches asunder, his barley at six and three-quarters. The quantity of seed he sows per acre, is, four bushels of wheat, three bushels of barley, and six bushels of oats. (*Communication from Mr. Blakie, of Holkham.*) On his farm it is a practice, not generally known, but which ought to be attended to, on rich soils, to draw the drills from north to south, and on poor weak soils, from east to west, if the nature of the ground will admit of that plan being followed.

" Cook's fixed drill-harrow is used once in spring, the hand-hoe is used twice; and the soil is not only cleared of weeds, but accumulated against the rising corn. The hoeings cost about twenty-pence each, per acre.

" Some Norfolk farmers, however, use a small horse-hoe. In Norfolk, they have lately adopted ' the inverted hoe,' as it is called from the shares being turned inwards, and placed something in the form of a cock's spur. This hoe, it is said, far surpasses any other now in use, being worked with perfect safety between rows of plants, while in their infancy, even as soon as they appear above ground, and it effectually cuts up all weeds between the rows.—The inverted hoes are of two descriptions,—one is adapted for clearing between the rows of plants, either at wide or narrow intervals, *sown upon the plat*; the other, at wide or narrow intervals, *upon the ridge*—though the rows of corn are only nine inches distant from each other, and they assert that the occasional trampling of the horse on the young plants is attended with no injurious consequences. (*Darwin's Phytologia*, p. 438.) The crops, particularly of barley—(The crop of barley is so strong that if a hat is thrown into a field it rests on the surface. This is called *rat-barley.*—*Young's Norfolk*, p. 251.), sometimes raised upon poor land, under this system, are astonishing. (It is observed, that on light soils, short ears of wheat are the most productive, and that the sample is the most uniform and weighty. In barley, long ears are preferred). The grain is sometimes said to be rather of a better quality. (*Young's Norfolk*, p. 246.)

It was formerly believed, that drilling was only applicable to light soils; but strong or heavy land is now cultivated in Suffolk, for spring-crops in drills, in a most perfect manner. The ridges are all carefully ploughed in autumn, or early in winter, to the *exact breadth* which suits either one movement of the drill machine, or two. In the spring the land is only scarified or harrowed, as it has been rendered thoroughly friable by the winter's frost, and the corn is drilled without a horse's foot treading any where, except in the furrows between the ridges. (*Communication from Arthur Young, Esq.*, *Husbandry of Scotland*, vol. ii. Appendix, p. 66.) Unless this practice is adopted, in very wet seasons, drilling would never answer in the wet and heavy descriptions of land, for the operation could not be carried on with the regularity and exactness that is necessary. (*Dickson's Husbandry*, vol. i. p. 401.)

" In comparing the drill and broad-cast systems, the following observations occur:—1. That with a view merely to the extirpation of weeds, drilling autumn or winter sown wheat is not essential, as the ground may be previously cleansed by a summer fallow;—but that it is highly important to be enabled to pulverize the ground between the rows of such wheat

in spring, for the reception of the clover-seeds; and that with drilled grain, the succeeding crop of clover must always be superior, both from the free admission of air, and as the corn is less apt to lodge. (*Communication from J. C. Curwen, Esq. M. P.*)—2. That on all lands where annual weeds are abundant, and where a number of hands can be procured for using the hoe, white crops, sown in the spring, may be drilled with advantage, for the purpose of clearing the land more effectually, and probably at a cheaper rate than hand-hoeing and hand-weeding broad-cast crops.—3. That lands of inferior quality will yield a greater produce under the drill, than under the broad-cast system. But—4. That, in highly-cultivated soils, where the crops are so luxuriant as to overpower all annual weeds, sowing broad-cast possesses advantages over drilling, the seed being scattered more evenly over the land, and the roots not being so matted together as when drilled. The operations consequent to drilling are apt, in such a soil, to force up the straw prematurely, and to render the crop unproductive. Hence, in rich soils, drilling has been so frequently given up. (This was particularly the case in the counties of Hertford and Lincoln.) And hence, probably, it is that Tull considered dung as prejudicial.

"On the whole, the drilling of culmiferous crops, where it is conducted with skill and attention, is a practice to be approved of. The great question at issue is, whether it is equally applicable to rich, soft, and moist soils, as it is to those which are of a poorer, harder, and drier quality, where a power to work the soil, and to render it friable, is of peculiar importance. Additional experiments, carefully conducted, are necessary, before this point can be decided in a satisfactory manner."

ELDER.

Elder (*Sambúcus Nigra*), Pentándria Trigy'nia, Linn.; and Caprifoliáceæ, Juss.

The elder is indigenous to this country, and very extensively diffused, growing with great rapidity, although it never attains a great size, seldom exceeding twelve or sixteen feet in height; there are two varieties cultivated.

1. Black Elder-Berry.
2. White Elder-Berry.

Culture, &c.

SOIL.

Will grow in almost any soil or situation.

PROPAGATED.

1. *By seed*, sown in beds in March, in the manner directed for the ash, the seeds being covered with earth to the depth of *one inch only*. The plants will be up by the latter end of May, and will be a foot high in the fall of the year; the after culture also must be the same as that directed for the ash. The seed must be gathered when *quite ripe*, and then mixed with sand in the proportion of four gallons of sand to one of the berries. The heap, which may be placed in a shed or cellar must be frequently turned until the time of sowing.

2. *By cuttings*. This is the mode almost universally adopted; strong young shoots of the preceding summer's growth, from one to three feet in length, should be selected; these may be planted either where they are to remain, or in nursery beds. The cuttings are to be inserted from twelve to fifteen inches into the ground, according to their length; they strike root very readily, and will form strong shoots the first year.

TREE.

1. If intended for standards, they should be planted from ten to twenty feet apart.
2. For hedge-planting, cuttings, or yearling plants, are inserted into the sides or tops of raised banks or ditches, a foot apart.

USE.

1. The wood, from its toughness, is made into butchers' skewers, angling rods, tops, &c., and is also much employed by turners and mathematical instrument makers. Shoemaker's pegs are in general made of elder and considered the best of any wood for that purpose.

2. From the expressed juice of the berries an excellent wine is produced, too well known to require any encomiums.

3. The flowers distilled with water form an agreeable article for the toilette.

4. The leaves, as well as the flowers, enter into the composition of some of our popular ointments, formulas for which are given in our National Pharmacopœias.

5. The ripe berries of the White Elder make a wine very similar to our best grape wine.

ELM.

Elm (*Ul'mus*), Petándria Digy'nia, Linn.; and Ulmáceæ, Juss.

There are several species of the Elm, but as useful timber trees the two following obtain the preference:—

1. Common small-leaved Elm (*Ulmus campestris*).
2. Broad-leaved Elm Wych Hazel (*Ulmus montana*), or Scotch Elm.

Culture, &c. of the Common Elm.

SOIL.

1. Prefers a dry soil, a deep rich loam, and a warm situation; it will not thrive on gravel or sand, or succeed in wet marshy situations.

PROPAGATED.

1. *By seed.*—This is unquestionably the best mode of propagation, but it unfortunately happens that the seed seldom ripens in this country, and therefore other modes are obliged to be had recourse to.

2. *By grafting and budding.*—Where flourishing trees of superior figure are required for avenues, hedge-rows, lawns, or park scenery, either grafting or budding on the *Scotch elm* is strongly recommended; by either of these modes fine stately trees will be obtained, and those unsightly suckers avoided which always disfigure those that are raised from layers and suckers.

TREE.

1. Requires an open space and much room for its roots to spread in.

2. May be planted in hedge-rows with less injury to the quick hedge than any other tree.

3. As the value of this timber consists more in the length and bulk of the shaft, than in the irregular growth of its branches; it is the business of the planter to train them up tall and straight, to keep their shafts clean, and not to suffer them to branch till within a few feet of the top.

The present mode of lopping, though conducive to the lengthening of the shaft, fills it full of rough protuberances, which by admitting water, are very prejudicial to the timber, and occasions the defects so generally complained of.

USE.

1. The wood being hard and tough is used for a variety of purposes; it is employed in the making of chairs, axle-trees, water pipes, casks, coffins, &c. The timber of the English elm is, however, compared with that of the Scotch elm, very inferior in durability and value. In the sales of these timbers, the English elm, among good judges, seldom brings more than a half or even a third part of the price of the Scotch elm, although both be of equal size and age. Prejudice, no doubt, may have some share in the matter, but certainly the timber of the one is very inferior to that of the other. Indeed, if it be considered that the one species is exceedingly hardy, and universally raised from seed, and that the other may even be termed delicate, at least in Scotland, there can be little hesitation, says Nichol's, in determining which deserves the preference as a forest tree.

Culture, &c. of the Broad-leaved Scotch Elm.

SOIL.

1. This tree will accommodate itself to almost any soil, but appears to prosper best in a deep rich loam; it forms the best timber when growing in light sandy soils with a firm bottom; but will thrive even in the most bleak and exposed situations, as between the crevices of rocks where there is little soil of any kind to give support to its roots, and even thus situated it flourishes and often attains considerable size.

PROPAGATED.

1. *By seed.*—In the choice and collection of seed, the following points require particular attention:—

1st. In all cases the seed should be taken from the finest, most promising, and healthy trees.

2nd. As soon as the seeds are perfectly ripened, they should be immediately gathered, as in wet or windy seasons the procrastination of a single day often defeats the desired object.

3rd. As many advise sowing the seed as soon as collected from the trees, more should never be collected in one day than can be sown on the following morning; for if laid in heaps they soon become heated, and the vegetating power of the seed completely destroyed. In some cases, however, it is neither convenient or possible to sow them until autumn or even spring; in these cases much attention is requisite, both as to the gathering of the seed, and also of drying it, so that it may be kept with safety until the period it is wanted.

2. The seed may be sown as soon as collected from the trees, but we should rather, says Mc Intosh, "advise saving it till March or April, or making three sowings; one in June when the seed is gathered; one in March, and a third in April. The ground for the seed-bed should be rather rich, having been under a slight crop the preceding season; and if not manured for it, it should be done previously to sowing the elm seed. As this seed does not require to be deeply covered, it is necessary to have the ground finely dug and raked, before the beds are formed, which should be four feet in breadth, and the seed covered to the depth of half an inch. Sometimes the crop of summer sown elms is destroyed in winter, when the season has been dry and the plants weak, and in such cases are liable to be thrown out of the ground by the frost. Sometimes the spring crop is destroyed if sown too early, and severe frosts occur just as the tender plants are coming up; but by sowing at the three stated periods above recommended, we have three chances of obtaining a crop. It is advisable to sow elm seed rather thin, as the seeds are in general good; and as it is better that the plants should remain two seasons in the seed-bed, previously to their being planted out in nursery lines, they will have a chance of attaining greater strength than if they were too much crowded in the seed-bed.

3. At four years old the young trees may be planted out where they are to remain, the ground being previously trenched and prepared; but where the ground is not previously prepared, the young trees should be suffered to remain one or two years longer in the nursery beds.

USE.

The same as the common elm, but its timber is much more valued for all the finer purposes to which the elm is applicable.

ENDIVE.

Endive (*Cichórium Endívia*), Syngenésia Polygámia Æquális, Linn.; and Compósita, Juss.

The endive is an annual plant, cultivated for its stocky head of leaves. There are three varieties.

1. *Green Curl-leaved.*—Considered the best for autumn and winter use.
2. *White Curl-leaved.* } Equally good for summer and autumn use.
3. *Broad-leaved Batavian.* }

Culture, &c.

SOIL.

This plant delights in a light rich mellow earth, and an open situation.

PROPAGATED.

1. *By seed.* Sown broad-cast, and for a bed four feet by ten, half an ounce of seed will be sufficient. Sowings should be made at three or four different periods; for a small early crop a little seed may be sown in the beginning of May; but for full and occasional crops in autumn,

winter, and early part of spring, sow any time from the end of July to the end of August.

2. The ground should be dug neatly over, and each sort sown separately, scattering the seeds thinly, and raking them evenly in.

PLANT.

1. When the plants are come up an inch or two, thin them out to two or three inches, to give them room to strengthen for final planting. When the plants are from four to six inches high, transplant them out into rows fifteen inches asunder, and twelve inches between plant and plant in the rows. The ground being neatly dug over, drills should be drawn, at the distance above mentioned with a hoe, and having taken up the plants and dressed off their lower roots and a few leaves, they should be inserted in the ground with a dibble, and a little water given them as soon as planted, continuing to supply them in dry weather. Plant the first crop in the latter end of June, and continue to plant successional crops every month till October. Plant a few out in November in a frame, to secure them more effectually from the frost.

2. *Blanching.*—As the transplanted crops advance to full growth, some should have the leaves tied up every week or fortnight, to blanch or whiten, and to render them tender, crisp, and mild-tasted. Perform this in dry days, avoiding frost. Using strings of fresh bass, or small osier strings, tie the leaves regularly together a little above the middle, moderately close. If the soil be light and dry, earth them up half way; but if moist merely tie them. The two curled sorts, if neatly earthed up, will blanch pretty well without being tied. The Batavian, from its loftier looser growth, in every case hearts and blanches better with a bandage. The blanching will be completed sometimes in a week, when the weather is hot and dry; at others it may take a fortnight or three weeks, after which the endive should be taken up for use or it will soon rot, in six days or less, especially if much rain fall. The endive may be blanched under garden pots or blanching pots, in the manner of sea-kale, or excluding the light by setting up flat tiles or boards on each side of the plants, resting against each other in an angular form and confined with earth.

3. *Occasional shelter.*—At the approach of severe frosts, they should be covered pretty thickly with straw litter, or plunged into a bank of light dry earth under a glass case or covered shed, open to the south.

4. *To save seed.*—Allot some of the strongest old plants in February or March, if any remain; otherwise sow seed in March or April, and transplant or thin the plants to twelve or fifteen inches distance. They will shoot and the seed ripen in autumn.

USE.

This plant is much esteemed in most families, and is, after being blanched, used in stews and soups.

FALLOWING.

"Experience would soon teach a man, when he was necessitated to raise the greatest possible produce from the land to meet the urgent demands upon it, that the existence of weeds in the land was injurious to his crops; that weeds which are the natural production of the soil were more easily fostered with manure, and less liable to be affected by the vicissitudes of the weather, than the cultivated corn crops. He would soon discover that it was not by a repetition of these corn crops that the weeds would be subdued; but that, on the contrary, every year would only give additional strength to them, so that in a few years the ground would be so matted together by the interlacing of their roots, that no tender plant like any of the cultivated ones, could possibly penetrate through such a mass of living net-work. Experience would soon teach all this. And yet in spite of this experience, which must be within the reach of every man who cultivates the ground on a large or small scale, the slovenly practice of allowing weeds to grow on cultivated lands, is too much countenanced in the agriculture of these islands. Corn crops must be sown early in spring; and as the whole summer is required to bring them to maturity, winter can be the only period of leisure, under such wretched management, in which the

land can be cleaned; but to attempt to kill weeds in a season when the progress of the plough and harrow is generally arrested by rain or frost, is impracticable.

"But, though the land cannot be worked to advantage in winter, it may be done so in summer, and in order to be able to accomplish this, and raise a crop of some kind at the same time, it is expedient to raise a green crop, such as beans, potatoes, or turnips, which being set in drills or furrows, so far apart from each other as to permit the passage of men and horses through the crop, a facility to the cleaning process during their growth is obtained. This culture of green and white crops alternately, is a successful expedient in checking the growth of weeds, in maintaining the fertility of land, and in enjoying the benefit of a crop. But still, experience, that hard and uncompromising master, places an obstacle to the success of even this plausible expedient of man. He still finds that weeds thrive very luxuriantly amongst his beans, potatoes, and turnips; and that being the case, it is hopeless to sow, among these weeds, a succeeding corn crop with any prospect of plentiful return. What, then, can he do? Fortunately another alternative remains. He can forego the sowing of a crop for one season, and try to clean his land in summer, when the power of the sun's rays can wither those noxious weeds, after they have been dragged to the surface of the ground by judicious operations. He no doubt thinks this a hazardous experiment, and a great sacrifice, to forego a whole crop for the sake of some paltry weeds. But how can he help it? Paltry as these weeds are, they effectually prevent the growth of his crops, and he is driven to this experiment by sheer necessity. He must clean his land, or lose the greater part of his labour in cropping the soil. This alternative will not permit of hesitation. Hence, then, the object of all fallowing is to clean the land, and to pulverise heavy tenacious soils; and hence also no fallowing but that in summer will effectually do it.

On every kind of soil, the fallowing process should be begun in autumn.* If the weather is dry, and the land in consequence become hard, the ploughing of the stubble-land should be delayed till it is softened by rain, as it is severer labour for horses to turn over hard soil, and its furrow-slice breaks and appears jagged when laid over; it is probable, too, that the plow may not be able to cut that furrow-slice from the bottom, but may leave part of the land below unploughed. The subsoil will be left serrated like the teeth of a saw, ready to intercept any percolating moisture. On the other hand, stubble land, in a green or moist state, is cut clean with the coulter, and turned over with an uniform and unbroken furrow-slice. The object of ploughing in autumn is to smother the surface-weeds, which would grow in mild weather even in winter, by inverting the surface of the ground; and to expose the earth under the root-weeds to the frost, by turning up the bottom of the furrow-slice to the air. It is clear that the more closely the inverted surface can be placed, and the more exposed the under part of the furrow-slice can be exhibited to the influence of the frost, the better is the chance of smothering the surface-weeds, and of killing the roots of the root-weeds.† The advantages of good ploughing cannot be questioned, and this can only be obtained in the greatest degree by placing, the fur-

* If the land is foul or subject to what is termed seed rubbish, such as charlock, (called in Sussex *kilk*, and in Kent *hinkle*) and poppy, which shed the greater part of their seed before harvest, in such case I do not recommend early ploughing, by doing which we turn in more seed than can be destroyed by five or six ploughings after. Where land is much infested with these weeds, I recommend scarifying, or using the broad share, about three inches under the surface, so as not to turn the surface over, but to cut the roots of the weeds, and then to harrow it fine, and pick off what harrows up, and burn it. Let the ground lay in this state till the seeds vegetate, before you use the plough.—*Correspondent.*

† If you smother the weeds, you will not however, destroy the seeds of the charlock and poppy, which I believe would continue in the earth for a century, and not lose their vegetative quality. I recommend early fallowing only where the land is free of these weeds.—*Ibid.*

row slice at an angle of 45 deg. with the horizon; and, yet a practice prevails at many places which decidedly runs counter with this principle, and that is,—of laying a loosened furrow right on its back, over the surface of a rib of land which is left untouched by the plough. The appearance of this kind of work is that of very ill made drills.

A free soil, in clean condition, which is not wished to be much affected by frost, may be usefully ploughed in this manner, for the purpose of keeping part of the land firm; but, while the furrow-slice receives all the benefit of the action of the atmosphere, the part upon which it rests is prevented from receiving any advantage. These ribs are generally made across the ridges, or at an angle with them; and, on strong land, they form a sort of receptacle for surface-water. This practice deserves, on every account, to be condemned. Light land, on open bottoms, may be advantageously ploughed, crown and furrow, to lie all winter; that is, what is the crown of the ridge at one time is made the furrow at another. Surface-water will not remain so long on such lands as to do them harm, but may assist to consolidate them, and even to irrigate them. Strong clay-lands, on the other hand, cannot be kept too dry in winter; and as their ridges have a considerable roundness, the best succeeding furrow that can be given, is to cleave down the gathered up ridges, that is, the open furrows of the rounded ridge are still kept the open furrows of the cloven ridge, while the crown of the rounded ridge is made the middle furrow of the cloven ridge; the rounded ridge being, in fact, cloven, or split in two. The furrow-slices of a rounded ridge meet from both open furrows in the crown; whilst the furrow slices of a cloven ridge depart from the crown to both open furrows, where they are prevented closing up the open furrows, by the plough passing up between the furrow slices, which would otherwise meet from two contiguous ridges. In this state strong land will lie dry all winter; and this mode of ploughing has the advantage of rendering the rounded ridges quite flat, which is the best position the land can be in for the cross furrow which is to follow. It is found desirable, in working all kinds of land, to plough a succeeding furrow at right angles, or nearly so, to the preceding one, because the land is thus most easily cut to pieces, and as it is the safest state for land to be in all winter, with the water furrows open, the next furrow to the fallow-land, which is given in spring, after the hurry of the spring-sown crops is over, is the cross-furrow, so named from its direction being across that of the ridges. This furrow cutting the land into detached pieces, which cannot resist the pressure of the mould-board is generally thrown up in an irregular manner, and presents, to the inexperienced eye, a confused aggregation of lumps of earth. Such a state, however, is well adapted for exposing a very enlarged surface of the soil to the ameliorating influence of light and air; and, if the weather continues dry after the ploughing, surface weeds will receive a check in their growth.

The land should lie in this state till the surface is dry, which is indicated by the earth assuming a light brown colour; and before the lumps become too hard from drought, the harrows should be set to work, and break down all these apparently confused lumps into a uniform surface. These harrowings should be repeated three or four double times, at right angles each time, as its great object is to loosen every kind of weeds, and bring them to the surface of the earth. In light lands, this ploughing and harrowing, destroy weeds, more than any other, and, upon such lands, the weeds should be immediately collected together into heaps. On heavy lands, too, they should be gathered at this time; but in case any fibre or root should be held in durance in the midst of the clods, it is advisable at this stage of the work, to use a heavy roller to bruise these clods into powder, its operation at this time being the most effectual, as the soil is yet pretty firm; whereas, if the rolling is left to an after period, when the soil has been greatly pulverized by ploughing and harrowing, the roller will press the clods into the soft earth instead of breaking them, and if they are not broken, it will be impossible to pick off all the weeds from the land.*

The power of vegetation at this period of the year, will cause weeds to increase very much, and if not subdued, great additional labour will be required ever after to keep them in subjection. It is a practice with many to carry off the weeds from the land, as they are collected. It is also a practice with many to burn these heaps of weeds on the land, instead of taking them off. Such a practice is not commendable. Heaps of weeds, to burn with effect, must generally be allowed to lie in the sun a considerable time, during which a new growth of them is probably making rapid progress in the soil, and in the eagerness to prevent it, the burning process is hastily performed, and many fibres and roots are again spread out, which it had before taken trouble to gather. Besides, all the manure they afford as ashes is very trifling compared with the mass of compost which they will yield either with lime, marl, or dung. "What better policy," asks Lord Kaimes on this subject, "than to make a friend of a foe?" This compost of weeds may be used in the spring in the same field from which they were taken, or applied with advantage to some bare piece of ground or hillock in a neighbouring field of the farm.

At this period of the fallowing process, drains may be most advantageously cut in the field, in wet soils, and any small stones that may be lying on the surface, should now be

* "Care should be taken not to use the roller on stiff tenacious land till it becomes dry, that the horses affixed to the roller do not bind the ground by treading, so as to cause it to plough bad the next time, which is often the case in stiff adhesive soils."

taken off as obstructions to future work, and deposited at once in these drains. [The taking off these stones on strong adhesive lands is thought injurious as they tend to break the soil.]

The furrow to be given to the land, after this cleaning process, must of course be in a line with the ridges, in order to cut the former furrow, which was ploughed across, and this may be done by ploughing the ridges either singly, or two, four, or six of them together. The latter is fully the better plan, as it serves to keep the land flat, that is, it will not interfere with the future regular appearances of the ridges when they are gathered up.* After harrowing this two double times at least, rolling and hand picking weeds must be repeated with great care; as the weeds being now not so numerous, and many of their roots having been broken by the plough and the harrow, they may be easily overlooked in a hurry. Every visible joint of couch grass must be gathered. Colt's-foot, docks, and thistles, must also be carefully rooted out and carried off. Light lands will seldom require more than this ploughing to make them clean, as the weeds in them readily part with the earth from their roots, and rolling will probably not be again necessary. It is almost certain, however, that strong lands will require another furrow, which may be one across, like the second, but only the furrow slices of it reversed, or an angle furrow begun at one corner of the field and continued to the opposite one in an oblique direction to the ridges. In the cross and angle ploughings, and in ploughing the land along the ridges after the winter- furrow, spaces for ploughing, generally of sixteen yards in width, are marked off, to save time in ploughing, to avoid many open furrows, and to keep the land level. Harrowing must again follow, and, if necessary, rolling, and hand-picking weeds, and gathering stones must also be repeated. [This practice is adopted on wet heavy lands.]

After all these operations have been performed, the land should be clean, if the weather has not been to wet. It is here necessary to caution the young fallowist in regard to strong clays. Should the weather prove wet, or likely to be wet, it will be improper to risk strong land so long out of the ridge, as if it be caught by much rain in a flat state, it will become soured before it be so dry as to permit the horses again upon it. One cross ploughing may be obtained in the spring, or early in summer; but rather than risk any more, it would be better to plough the ridges together, backwards and forwards, casting them out, and ploughing them together alternately. In this way the furrows are always kept open for the passage of water. In such a season it will be vain to attempt to clean land thoroughly. At this stage of the work, the four-horse plough may be advantageously employed on deep soils that are worn out by miscropping. It will bring up fresh soil, which has not seen the light of day for many years. Up to this period the preparation of the land for bare fallow and turnips, is the same.

The next process in wet soils, is to form the land into ridges, so that it may be ready to receive the lime or dung, or both. Land is restored to ridges, by placing poles in the exact line of the former ridges, and throwing open a wide furrow in the line of the poles, which is closed again when the ridge is to be ploughed. This ploughing is always a gathering up. On light lands, this gathering up, or crown and furrow, is all that is necessary for the seed furrow, and it covers the lime and dung at the same time; but, on strong soils, a gathering up is generally given before the lime or dung is applied, as it is necessary to keep such soils well rounded in shape, to prevent the rain or melted snow in winter injuring the wheat, or souring the land with stagnant surface water. Lime may be spread on the land before or after the dung is applied. If both are to be spread on the land at the same time, lime must be laid on in precedence to the dung, and it can be done either in small heaps, taken out of the cart and placed at regular intervals between the furrows of the ridges, and left to slack there by the weather, or spread out of carts by shovels, taken from large heaps containing about five cart-loads each, which had been placed at intervals. The latter is the best plan, as the driving of it does not interfere with the working of the land, and lime always slacks most equally in large heaps. A man with a single horse-cart, and lime-shovel at each heap, will spread over a large surface of land in a day, especially if one set of carts is filling at the heaps, while the spreader is emptying the other, and the full cart taken to, and the empty cart taken away from him. As a matter of precaution, from the injurious effects of the causticity of the lime, the spreader should cover his face with a piece of thin gauze, and the hind part of the horse should also be covered. A calm day, or the wind blowing obliquely across the cart, is the best kind of weather in which to spread lime on land. Whenever the lime is spread, it must be immediately ploughed in, as shallow as possible, whilst it is dry, as rain soon renders slacked lime an adhesive mass.

If land is to be twice ridged up for the reception of the seed, it is best to apply the dung at the first gathering up, and then let it lie for some time to incorporate with the soil, before it is seed furrowed. In this case, the lime should not be laid on till immediately before the seed furrow is ploughed, and which, being a light one, will not bury

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* This only applys in wet and adhesive lands, in many places this process cannot be adopted, where the Farmers use the turnrice plough and lay the whole surface flat.

the lime too deep. This mode has the advantage of spreading the lime above the dung, and the latter having a tendency to rise to the surface, is kept down by the weight of the lime; and the lime on the other hand having as strong a tendency to sink, is kept up by the dung below. When dung is applied on the ridge, it is taken from a large dunghill, which has been well rotted by turnings, and conveniently placed in some part of the field. The head-ridges are the best place for dunghills, if the ridges or the fields are not too long. The dung is deposited on the land in heaps of equal size, at equal intervals, more or less apart, according to the quantity which the land is to receive, and spread equally over the ridge between the furrows. The spreading of dung should be particularly well done, as large lumps left here and there cause an unequal growth of the succeeding crop. The quantity of dung which strong land requires after a good bare-fallowing, is from twelve to fifteen tons per imperial acre, according as it has received lime or not; and the quantity of lime for the same space of ground, on the same kind of land, may be two hundred or two hundred and forty bushels.

Every operation of fallowing may be concluded by the end of July, after which the land lies with the dung in it till seed time. At that time the drills are harrowed across a double time, the ridges then furrowed, lime spread on and harrowed in, and the land lightly seed furrowed, all is then ready for the seed being sown on it at the first favourable opportunity. Wheat is the kind of grain which is almost always sown after the expensive bare fallow, as the crop which yields the most valuable return from the land. September and October are considered in some counties favourable months for sowing fallow wheat, but in Sussex we find from experience October and November early enough. It may also be sown after the green fallow of beans, potatoes and turnips, till November, and in spring, not later than February. When wheat is sown, the greatest quantity of harrowing which it requires even on strong land is three double times, once along the ridges, when the seed is said to be broken in, another across them to fill up the open furrows, and a third along the ridges again as a finish. Too much harrowing is not good for wheat, as the rough clods left on the surface of the soil moulder down by frost in winter, and fill up the soil to the roots of the young plants, which are thus encouraged to sprout out. The open furrows should then be cleared out with a double mould-board plough and single horse. Cuts should be made across all hollows and head ridges into which water may be suspected to stand in winter, and these, and all the ends of furrows at the ends of the ridges, should be carefully cleaned out with the spade, and all the shovellings should be thrown back from the edges of these small ditches, which are thus made temporary canals to carry off superfluous water. This finishes the laborious work of fallowing, and upon the whole, a well finished fallow-field after wheat seed-time, is as neat and clean a piece of work as the husbandman can exhibit. When he has got all his crop safely in and covered, his stack-yard gate closed, and the wheat sown on the fallow land, he may sleep soundly on his pillow, and pray "Heaven to be gracious, for now laborious man has done his part."—*Journal of Agriculture.*

FENNEL.

Fennel (*Anéthum fœniculum*), Pentándria Digy'nia, Linn.; and Umbelliferæ, Juss.

This is a hardy perennial and aromatic plant, of which the following varieties are cultivated:—

1. Common or Sweet.
2. Dark Green-leaved.
3. Dwarf or Finochio.

This last variety is distinguished from the others by its tendency to swell in the stalk to a considerable thickness; this thickened part is blanched by earthing up, and is then very tender.

Culture, &c.

PLANT.

1. All the varieties are raised from seed or offsets from the root of the old plant; but propagation by seed claims a decided preference, on account of the offsets having tap roots, which, if broken, never grow strong afterwards.

2. The seed should be sown in the spring, in light rich earth, either in drills fifteen or eighteen inches asunder, or broad-cast, and when the plants are come up they should be thinned out to twelve or fifteen inches apart.

3. As the roots of old plants divide into side offsets, they may be slipped off in spring, summer, or autumn, and planted a foot apart.

4. *Subsequent Culture.*—The same plants remain several years by the root; but as fennel sends up strong stems for seed in summer, these, or part of them, should be cut down to encourage a production of young leaves below in succession. It is apt to spread more than

is desirable if suffered to seed. The swelling stems of the finochio variety, when of some tolerable substance, should be earthed up on each side five or six inches, to blanch them white and tender. This will be effected in ten days or a fortnight, and by successive sowings, or cutting down plants during summer, successive crops of blanched stalks may be had from June to December.

USE.

1. The common fennel is now but little used for culinary purposes, except as a sauce for mackerel. The leaves are sometimes used in salads and garnishes, and the seeds are often employed for medicinal purposes.

2. The blanched stalks of the *dwarf variety* are eaten with oil, vinegar, and pepper, as a cold salad, and they are likewise occasionally employed in soups.

FIG.

Fig (*Ficus Cárica*), Polygámia Dioe'cia, Linn.; and Urtíceæ, Juss.

The fig tree is a native of Asia and Barbary, but is successfully cultivated in England, sometimes even as a standard or espalier tree, but generally, when it enjoys the protection of a wall and a southern exposure. The history of the fig tree possesses considerable interest, and its botanical character is very curious. The Library of Entertaining Knowledge observes—"There is something very singular in the fructification of the *fi'cus cárica.* It has no visible flower, for the fruit arises immediately from the joints of the tree, in the form of little buds, with a perforation at the end, but not opening or shewing any thing like petals, or the ordinary parts of fructification. As the fig enlarges, the flower comes to maturity in concealment; and in the eastern countries the fruit is improved by a singular operation, known by the name of *Caprification.* This is performed by suspending by threads, above the cultivated figs, branches of the wild fig, which are full of a species of cynips. When the insect has become winged, it quits the wild figs, and penetrates the cultivated ones for the purpose of laying its eggs; and thus it appears both to insure the fructification by dispersing the *pollen*, and afterwards to hasten the ripening by puncturing the pulp, and causing a dispersion or circulation of the nutritious juices. In France this operation is imitated by inserting straws dipped in olive oil."

The Horticultural Society enumerates seventy-five varieties as cultivated in their gardens; Loudon gives fifteen, from which the following are selected, the two first for their excellence, the remainder for their hardiness:—

1. *Black Ischia fig.*—A middle sized fruit, the skin almost black when ripe, and the inside of a dark red. The flesh is high flavoured, and the trees good bearers.

2. *Brown and Black small Italian figs.*—These are cultivated in *pots*, the fruit is small, round, and very delicious. Forsyth gathered from one plant, in a "24-sized" pot, two dozen of figs at one gathering.

3. *Brown chesnut-coloured Ischia.*—One of the largest we have; it is of a brown or chesnut colour on the outside, and purple within; the grains are large and the pulp sweet and high-flavoured. It ripens in August, and if planted against a hot wall, two crops may be obtained annually.

4. *Black Genoa fig.*—This is a long fruit of a dark purple colour, the inside being of a bright red, and the flesh very high flavoured. It ripens in the latter end of August.

5. *Small white early fig.*—The skin is of a pale yellow when ripe, the flesh white and sweet. It is ripe about the latter end of August or beginning of September.

6. *Large white Genoa fig.*—This is a large fruit, the skin thin and yellow when ripe, and red within. It is a good fruit, and is ripe about the latter end of August. This and the preceding, bear two crops annually.

Culture, &c.

SOIL.

A rich loam with a dry bottom and a free exposure, seems best adapted to the growth of the fig. On dry sandy soils it is very apt to cast its fruit.

Propagated.

By seeds, cuttings, layers, and suckers; the most approved mode, however, is by cuttings and layers.

1. *Cuttings.*—Cuttings are taken from the most fruitful well-ripened short-jointed boughs in autumn, from ten to fifteen inches in length, with one or two inches of old wood attached. They may be either preserved till spring, or planted at once, with their tops entire, from six to nine inches deep, in pots or in beds of rich earth composed of sand and loam; they readily take root, and at the expiration of the second or third year will be ready for planting out.

2. *Layers.*—This is the readiest mode of obtaining bearing trees, for shoots of two or three years growth may be laid in the spring, and will be ready for final planting the succeeding autumn.

Tree.

1. The fig tree may be grown either as a standard, espalier, or against a wall; the latter is preferred in our cold and uncertain climate, because of the facility with which it may be protected in winter. The distances at which trees may be planted will depend upon the height of the walls; but where these are low, or espalier rails adopted, it is usual to plant them from eighteen to twenty feet apart.

2. *Standards.*—This tree is always grown as a standard in fig countries, and will even succeed as a dwarf standard in our own country, under favourable circumstances and in warm situations. Some of the best in England are grown at Arundel castle, in this county; there is also an excellent fig orchard at Tarring, and another at Sompting, near Worthing. Those at Arundel are planted six or eight feet apart, and from a single stem allowed to continue branching into regular conical heads; pruning chiefly redundant and irregular growths, and cutting out decayed or injured wood. The ground is manured occasionally and stirred at least once a year; and for protection from the frost during winter, the circumfirential lower branches are buried six inches in the soil, and the central ones enveloped in litter.

3. *Pruning.*—It has been a common observation that fig trees must not be pruned, as a *pruned tree never bears fruit*; they therefore become straggling unsightly objects. But recent experiments have pretty nearly proved the fact, that the fig tree *may* be pruned, and being kept in regular form and order, may be rendered proportionably prolific. Mr. Wickham, with a view to procure abundance of midsummer shoots, which in this climate alone are to be depended upon, breaks off the spring shoots about the period that the flow of the spring sap abates, taking care to leave unbroken enough of each shoot to admit of its being nailed close to the wall at the next winter pruning, and to secure one eye at the least uninjured by the fracture. The shoots are to be broken, not cut, and the operation causes the protrusion of two or three midsummer shoots, by which the supply of bearing wood is greatly increased. "Keeping this object in view," he adds, "the knife cannot well be used too freely in cutting away the old wood." Knight highly disapproves of training the branches of fig trees perpendicularly, as encouraging too much the prolongation of the shoots; the stems, if there be as usual many within a narrow space, he gradually reduces to one only, and from the top and parts near it, he trains in the lateral branches horizontally and pendently, in close contact with the wall. Under such treatment all troublesome luxuriance of growth soon disappears; the pendent shoots will not extend more than a few inches annually, and few or no more leaves will be produced than those the buds contain before they unfold. The young wood consequently ceases to enlongate very early in the season, and thence acquires perfect maturity; and by being trained close to the wall, is placed secure, or nearly so, from injury by the severest frosts. The quantity of mature and productive young wood, thus necessarily becomes very great, relatively to the size of the tree; and the fruit being in contact with the wall, and not shaded by excess of foliage, acquires an early and perfect maturity.

To produce fertility in the last year's midsummer shoots, the Rev. G. Swayne has adopted a mode of de-fructification, which he considers specific. It consists in rubbing off, as soon as they can be seen "all the figs which are produced after midsummer on the same year's shoots." The object is to prevent exhaustion, and to promote the preparation of new embryo figs for the succeeding year. If the operation be performed in due time, it will not fail to prepare on one, and often on both sides of almost every fig so displaced, such embryos. For this purpose, the trees should be examined once a week, from the beginning of August, at which time the figs of this second crop make their appearance.

4. *Protection during winter.*—This is considered indispensably necessary by most gardeners, and many modes of defending the trees have been recommended. Mr. Wickham observes, "that the covering, where used, should be as thin and light as the circumstances of situation, aspect, local shelter, and varying temperature will admit, and that it should generally be removed in the day time, and always on the return of moderate weather,

Woollen nets, rough and strong in texture, have been recommended, but experience is wanted to ascertain if they can really be relied upon as adequate protection.

USE.

It is cultivated in this country entirely for the dessert.

FILBERT.

Filbert (*Córylus Avell'ana*), Mon'œcia Polyándria Linn.; and Amentáceæ, Juss.

The county of Kent, and more particularly the district round Maidstone, and extending to the borders of Sussex, having been long celebrated for the production of large crops of filberts, and of a much larger size than are generally grown, the following description of their method of cultivation and pruning, by the Rev. Wm. Williamson, A.M. as published in the fourth volume of the Horticultural Transactions, cannot but be acceptable to our readers.

Culture, &c.

SOIL.

The first consideration in making a plantation, is to select a proper soil, for if that be not congenial to the constitution of the plants, we cannot expect any great success. The soil in which the most experienced cultivators suppose the filbert to flourish best, is a hazle loam of some depth with a dry subsoil. If the sub-soil be too retentive of moisture, the trees are apt to run too much to wood, without throwing out those short twigs upon which the fruit is generally produced. That part of Kent where the filbert is chiefly cultivated, is a loam upon a dry sandy rock. As a general rule, that soil which is proper for the growth of hops, is thought to be also congenial to the filbert.

The filbert requires a considerable quantity of manure; the grounds in Kent are dressed every year, or at least once in two years. Every kind of manure is beneficial, but old woollen rags are found to produce the greatest effect. If Kent had not been a hop county, these would scarcely have been thought of; but as the same soil is congenial both to the filbert and the hop, it would soon occur to the intelligent cultivator, that probably woollen rags might be as beneficial to the filbert as they are known to be to the hop.

PROPAGATED.

By seeds, by suckers, by layers, and by grafting. Each is practised according to the peculiar object of the cultivator. The method adopted in the district above-mentioned is by suckers; they come sooner into bearing and make stronger plants than either layers or grafts. They are taken from the parent plant generally in the autumn, and planted in nursery beds (being first shortened to ten or twelve inches), where they remain for three or four years; they are slightly pruned every year in order to form strong lateral shoots, the number of which varies from four to six. The most free-growing plants are obtained by sowing the nuts, but they are so coy in coming to a productive state, and so much inclined to generate into inferior varieties, that this method is never resorted to in making a permanent plantation. The plants raised by laying and grafting are of more humble growth, and therefore better adapted for small gardens where the economy of space is an object of importance.

Pruning.—The method of pruning the filbert being so different from that of every other tree, and being not generally practised beyond the County of Kent, a particular explanation of it will be necessary.

Before any one can possibly prune a tree with propriety, it is necessary that he perfectly understand the mode of its fructification. The fruit of the vine is produced only upon shoots of the preceding year; cherries are grown chiefly on short spurs emitted from the sides of the larger branches; if, therefore, the last year's shoots of the vine, or the spurs of the cherry tree are destroyed, there can be no fruit. Now, in some respects, the filbert is similar in its fructification to both these trees; the bearing branches being always those of the preceding year, similar to the vine; and these branches, if the tree be properly pruned, might, with great propriety, be called spurs, allowing for the difference between the filbert and the cherry; these short twigs or spurs are not more than a few inches long, every bud of which, in a good year, produces good fruit. The great object of the following method of pruning, is to cause the trees to throw out these spurs in great abundance, and when they are got to a proper bearing state, more than sufficient will be produced.

Though it is the usual practice to plant the suckers in nursery beds, Mr. Williamson recommends every one to plant them where they are to remain, whether they are intended

for a garden or a larger plantation; and after being suffered to grow without restraint for three or four years, to cut them down within a few inches of the ground. When the remaining parts of the trees are well rooted in the soil, five or six strong shoots will be produced. Whichever method is practised, the subsequent treatment of the trees will be exactly the same.

In the second year after cutting down, these shoots are shortened; generally one-third is taken off. If very weak, Mr. W. advises that the trees be quite cut down a second time, as in the previous spring; but it would be much better not to cut them down until the trees give evident tokens of their being able to produce shoots of sufficient strength. When they are thus shortened that they may appear regular, let a small hoop be placed within the branches, to which the shoots are to be fastened at equal distances; by this practice two considerable advantages will be gained, the trees will grow more regular, and the middle will be kept hollow so as to admit the influence of the sun and air; but this in a large plantation would be almost impossible, nor indeed is it necessary, though in private gardens where regularity and neatness are almost essential, it ought to be practised.

n the third year a shoot will spring from each bud, these must be suffered to grow till the following autumn or fourth year, when they will be cut off nearly close to the original stem, and the leading shoot of the last year shortened two-thirds.

In the fifth year, several small shoots will arise from the base of the side branches which were cut off the preceding year; these are produced from small buds, and would not have been emitted had not the branch on which they are situated been shortened, the whole nourishment being carried to the upper part of the branch. It is from these shoots that fruit is to be expected. These productive shoots will in a few years become very numerous, and many of them must be taken off, particularly the strongest, in order to encourage the production of the smaller ones; for those of the former year become so exhausted that they generally decay, but whether decayed or not they are always cut out by the pruner, and a fresh supply must therefore be provided to produce the fruit in the succeeding year.

The leading shoot is every year to be shortened two-thirds, or more should the tree be weak; and the whole height of the branches must not be suffered to exceed six feet. Every shoot that is left to produce fruit should also be tipped, which prevents the tree being exhausted in making wood at the end of the branch.

The filbert is a monœcious plant, and consequently produces the male and female blossoms separately on the same tree; the slender scarlet filaments which are seen issuing from the end of the buds early in the spring, are the female or productive blossoms; the barren or male blossoms are formed on long cylindrical catkins, which fall off as soon as they have performed their office; in pruning care must be taken to leave a due supply of these to fructify the female blossoms, or our previous trouble will be useless; this may be done without difficulty, for they are perfectly visible at the time of the pruning.

The method of pruning above detailed, might, in a few words, be called a system of spurring by which bearing shoots are produced which otherwise would have had no existence.

It frequently happens that a strong shoot springs from the root, and should any of the first year's or leading branches be decayed or become unproductive of bearing wood, it will be advisable to cut that entirely away, and to suffer the new shoot to supply its place, which aftewards is to be treated in the same manner as recommended for the others.

Old trees are easily induced to bear in this manner, by selecting a sufficient number of the main branches and then cutting the side shoots off nearly close, excepting any should be so situated as not to interfere with the others, and there should be no main branch directed to that particular part. It will, however, be two or three years before the full effect will be produced.

"But though this method of cultivation has long been celebrated, yet it does not appear to me," says Mr. W. "so particularly successful as to deserve the encomiums which have been bestowed upon it; for that thirty hundred weight per acre have been grown in particular grounds and in particular years, yet twenty hundred weight is considered a large crop, and rather more than half that quantity may be called a more usual one; and even then the crop totally fails three years out of five, so that the annual average quantity cannot be reckoned more than five hundred weight per acre.

"When I reflected upon the reason of the failure happening so often as three years out of five, it occurred to me that possibly it might arise from the excessive productiveness of the other two, the whole nourishment of the trees being expended in the production of the fruit, and that consequently they might be unable properly to mature the blossom for the following year. We know that peach and nectarine trees may be so pruned as to force them to bear a superabundant quantity of fruit in some one year; but we find that a regular crop in succession is thereby prevented, and that too for several years. In order to ensure fruit every year, I have usually left a large proportion of those shoots which from their strength I suspected would not be so productive of blossom-buds as the shorter ones, leaving them more in a state of nature than is commonly done; not pruning them so closely as to weaken the trees by excessive bearing, nor leave them so entirely to their natural growth as to cause their annual productiveness to be destroyed by a superfluity of wood.

These shoots in the spring of the year I have usually shortened to a blossom-bud, for the reason before given.

"The great art of pruning is to produce the greatest quantity of fruit without any injury to the crop of the succeeding year, which, in my opinion, is not done by the Kentish method. But by observing the rule I have laid down, though the trees do not *perhaps* bear so great a weight in any one year, as by the method before detailed; yet the crops in the whole are certainly not less, with this great advantage both to the public and private grower, that a moderate and regular crop is insured in every successive year; I think that by this plan the average might in the whole well be greater. The year 1819 was a very productive one, I grew two hundred weight of filberts (weighed when gathered) upon fifty-seven trees, the greater part of which were not seven years old (reckoning them from the time of their being cut down), and growing upon three hundred and sixty square yards of ground, which is after the rate of twenty-seven hundred weight per acre, and upon part of the ground ten more trees are now planted, which, if they had come to a bearing state, would have increased the quantity to more than is considered an extraordinary crop, besides having grown upon the older trees a moderate but regular quantity for several years preceding. I am the more confirmed in my opinion that the failure is caused by excessive bearing, by observing that there is very little blossom on my trees this spring, which has not been the case in former years."

In order to strengthen the tree as much as possible, care should be taken to eradicate the suckers from the roots, which is effected by exposing the roots, to a moderate distance from the stem, to the frosts of winter. The excavation in the spring is filled with manure.

As filberts are several years in coming to perfection, it is usual to plant hops, standard apples, and cherries, among them. When they come to a bearing state the hops are destroyed, and the fruit trees suffered to remain. The ground is then planted with gooseberries, currants, &c. and an under crop of vetegables is likewise frequently obtained. If this were not practised, the crop of filberts alone, except in particular years, would not defray the expence. The distance at which filberts are planted must depend upon their being mixed with other fruit.

USE.

As a table fruit for the desert the Filbert is held in high estimation.

FIR.

Fir (*Abies*), Monœ'cia Monadélphia, Linn.; and Coníferæ, Juss.

Next to the Oak, the Fir the Pine and the Larch, constitute our most valuable timber-trees; but, independent of their value in this respect, their beautiful foliage and magnificent appearance have at all times rendered them objects of admiration and attention. The term *fir* is often indiscriminately applied both to the fir and the pine, and hence we frequently hear the Scotch *pine* improperly called the Scotch *fir* by those who are unacquainted with botanical nomenclature.

Of the genus *Pinus* upwards of twenty species have been introduced into this country, but the Pinus Sylvestris is the only one in general cultivation, whilst of the *fir* tribe the Spruce Fir, perhaps, is the only one of its genus capable of profitable cultivation, although the Silver and Balm of Gilead Firs, in certain localities, form very useful and highly-ornamental trees.

The Larch, although a deciduous tree, is both valuable and ornamental; for a description of which, see *Larch*.

In describing the pine and firs, in the order enumerated, we have—

1. Scotch Pine (*Pinus Sylvestris*)
2. Spruce Fir (*Abies Communis.*)
3. Silver Fir (*Abies picea.*)
4. Balm of Gilead Fir (*Abies Balsamea.*)

Culture, &c. of the Scotch Pine.

SOIL.

The Scotch pine, according to Sang, grows in the highest state of perfection on the sides of mountains, in dells and hollows, among stones and rocks, beside rapid rivulets or mountain torrents.

It will grow and flourish in any kind of soil, from a sand to a clay, provided the sub-stratum be rubble or rock, but in wet tilly soils it ought never to be planted; because whenever the roots have exhausted the turf or upper soil, and begins to perforate the subsoil, the tree languishes and dies.

PROPAGATED.

1. *By seed.* The cones which contain the seed should be collected in January, and carefully preserved in a dry loft till the month of April, the proper period for sowing In general much difficulty is experienced in separating the seed from the cones; hence they are usually divided (by an instrument constructed for the purpose) into four equal parts, and then subjected to the action of heat by being placed in a cone-kiln, constructed after the manner of a malt-kiln; by this process the seeds are readily separated, and it is always adopted when large quantities are required, but in ordinary cases, the cones being split, may be exposed in a sieve tilted before a gentle fire, with a sheet of paper placed beneath it to receive the seeds as they fall out. The seeds should be removed every quarter of an hour, because, being small, their vegetating power is soon destroyed by exposure to heat. Where much difficulty exists, the separation is greatly facilitated by steeping the cones for some hours previously in warm water. These processes should on no account be performed until the time of sowing, as the seeds soon loose their vegetating power, when separated from the cones; and those nurserymen obtain the largest crops, who are the most attentive to this point.

2. The seeds should be sown in beds of any convenient breadth, in ground which has been previously prepared by digging, &c., and if poor, well-rotten manure must be added: but if manured for a light previous crop, as peas, beans, lettuces, turnips, &c., it will be much better. The ground should be well broken in the process of digging, and should be raked as that process proceeds. The seeds should be sown in a regular manner, at about a quarter of an inch distant from each other, and previously to their being covered in, a light wooden roller may be drawn over them, to press the seed firmly into the ground, as well as to place them all at an equal depth. In covering the seed care must be taken not to bury them too deeply: neither should they be left too near the surface; upon an average, half an inch may be considered the proper depth at which they may be covered.

TREE.

1. As soon as the plants are up and a little advanced, they require to be carefully hand-weeded, otherwise the crops will sustain considerable injury on that account.

2. When one year old, they are sometimes transplanted from the seed-bed and put out into nursery lines, where they are suffered to remain for two years; but it is far more eligible to allow them to remain for two seasons in the seed-bed, and then to transplant them into nursery lines for one year, at distances of twelve inches between the lines and six inches apart in the lines. They should never be allowed to remain more than two years in the seed-bed, for in that case they will be completely spoiled. Two-year seedling Scotch pines of good growth, one year planted out in good grounds, rise with far better roots, in proportion to their tops, than when of any other age, and are therefore more fit for general use. This tree will not succeed when planted large, and few succeed better, when of a proper size and age

3. When plantations of Scotch pine are required, they should be planted out in the latter end of March or in the beginning of April, in damp weather, at distances of from three to three feet and a half apart.

It is necessary to keep such plantations thick in the early stages of their growth, in order that the tree may tower the faster, and push fewer and weaker side-branches. When thus planted, no farther care will be required until the trees are ten or twelve feet high, prudent thinning and careful pruning being all that is required during the future progress of the plantation.

4. In point of situation, the tree will grow in almost any locality, and, as Pontey justly observes, "it may truly be called the planter's forlorn hope," as where it fails, the case is truly desperate. For instance, it is planted with success on the most barren commons, where no other tree or plant (the heath excepted) will grow. On sites which are elevated and exposed to particular currents of wind, it often proves the only tree that can be got up, except so far as others may rise under its shelter. In the sea-breezes, too, it is frequently observed that while every plant around it bends to the blast, as if seeking its protection, this holds its head erect, and bids defiance to the noxious gale.

USE.

1. This tree furnishes us with the best red or yellow deal, which is applicable to a variety of purposes, as for masts of ships, flooring, wainscot, tables, boxes, violins, &c.— Accordingly, as oak is the chief timber in building ships for the seas, pine is the principal one in the construction of houses upon land. It is "the builders' timber," and as, when the carpenter wants a post or a beam of a peculiar strength and durability, he has recourse to the oak; so when the shipwright wishes to have a piece of timber that shall combine lightness with great length, as for a spar or mast, he makes use of the pine.

2. "As a nurse," says Mc'Intosh, "no other tree equals the Scotch fir; and like the larch, it will become a large and valuable timber-tree, in soils and situations where no other tree will at all succeed." The disrepute into which this tree has fallen of late years is, probably, more to be attributed to the planter than to the tree. In soils capable of bringing the oak, ash, chesnut, and similar trees to perfection, it would be wrong to plant this fir, unless as a nurse-tree to be cut out when *young*, while it may, with every propriety, be planted with a view to produce timber-trees, in soils and situations decidedly unfit for either of these to prosper in. "Choosing fit soils and situations for different trees to be planted in has been too little attended to, and the erroneous practice of planting trees promiscuously in the same plantation, whatever the soil may have been, has, we think, been attended with sufficient disappointments to convince the observing planter of the truth of this assertion—The most successful result will always be from such plantations where the kinds of trees have been suited to the soil and situation."

3. Resin is obtained by making incisions into the trunk and branches of the tree; and the roots, by distillation, afford tar.

4. A fluid extract, prepared by decoction from the twigs of the *Pinus Sylvestris*, is the well-known essence of spruce, which, fermented with molasses or sugar and water, forms the fashionable and wholesome beverage of Spruce beer.

Culture, &c. of the Norway or Spruce Fir.

SOIL.

This tree will both grow and thrive in soils of very different qualities. It succeeds best, however, in a deep loam and low situations where it has sufficient scope for its roots; but in shallow soils and exposed situations it never succeeds.

PROPAGATED.

By seed, which ripens in December, at which period the cones should be gathered and preserved carefully till April, when they should be taken out, and sown in every respect as directed for the Scotch pine.

USE.

The timber of this tree is inferior to the common pine, both in bulk and durability; and that which is grown in this country is seldom used but for the coarsest purposes, in consequence of its inferior quality; and being often knotty, it is ill adapted for supporting horizontal pressure. White Norway deal is, however, used for a great variety of purposes in building, and the entire trees are more prized than any other, for masts for smallcraft, for spars both for marine purposes and on land. What constitutes the value of this fir is, that its timber is equally durable at any age, like that of the larch; and what renders it peculiarly adapted for masts, spars, scaffolding poles, &c. is, its habit in almost every case, whether standing single or detached, of growing perfectly straight and erect. This tree may be cut for rods, stakes, and scythes, or other implement-handles, when the trunk at the base is not more than two inches in diameter, and the bark being kept on, it will prove almost as durable as the larch.

2. This is a valuable tree, considered as a nurse for protecting other trees; for being evergreen, and closely covered with branches, the radiated heat is in a great measure retained, at the same time it affords an excellent shelter for the most valuable game.

3. By incision the tree affords a resin, from which, by various preparations, turpentine and Burgundy pitch are obtained.

Culture, &c. of the Silver Fir.

The Silver Fir is a fine majestic tree, and is chiefly grown in this country for ornamental purposes.

SOIL.

This tree will grow in various soils and situations. In sandy loam, in gravel, in clay, and in low and in elevated situations, it has equally succeeded; but it certainly requires a richer soil and a warmer climate than either the pine or the larch.

PROPAGATED.

1. By seed. The cones ripen in October, at which period they should be gathered and carefully preserved till spring. The seed-beds should be prepared in the manner directed for the larch, and the seeds sown so that they may come up about three to a square inch; the seed should be covered carefully with earth an inch thick; for if they be either too lightly or too deeply covered they will be alike destroyed; the same observation equally applies to all the fir tribe, for although they are extremely hardy when grown up, they are very tender in infancy.

TREE.

The young plants should be allowed to remain two years in the seed beds, and then transplanted into nursery lines nine inches asunder and six inches apart in the lines, there to remain two years longer, at which period they may be transplanted where they are finally to remain. They should be carefully weeded, however, during the whole of their nursery culture.

USE.

The timber is much inferior both to the pine and the spruce fir, and is chiefly planted for ornamental purposes. Its growth is exceedingly rapid, and soon attains a magnificent size and appearance.

Culture, &c. of the Balm of Gilied Fir.

This is an ornamental tree of more delicate habits and smaller size than the silver fir.

SOIL.

To thrive well it should be planted in a black rich soil or sandy loam.

PROPAGATED.

1. *By seed*, which should be collected, preserved, and sown in the manner directed for the silver fir, the seed being covered with earth not less than half an inch, or more than three quarters of an inch in thickness.

USE.

As an ornamental tree, being generally planted round the skirts of our plantations and shrubberies, for which latter purpose it is peculiarly adapted; the tree during summer emitting a pleasing terebinthinate odour.

FISH.

The breeding of fish is carried on to a very limited extent in Britain, owing to the great superiority of the sorts obtained by fishing in the rivers or the sea; they are, however, oftentimes bred and reared for the market; and in gentlemen's grounds considerable attention is sometimes paid the stocking of ornamental pieces of water with appropriate fish. The mode of constructing ponds will merit our first attention. The first thing to be considered is the situation, which, together with the extent of the pond, must, of course, vary according to circumstances. If constructed with a view to profit, the situation with respect to appearance will not be so much an object; but if intended as an ornament and for beautifying the scenery, situation should be particularly studied, as nothing is so elegant in appearance as sheets of water seen alternately in approaching a gentleman's residence.

If possible a marshy or wet place should be fixed on for a pond, as this

kind of place will retain the water better than a dry sort of soil, and is generally fit for nothing else, or at least might not otherwise be so well employed. If ornament be not considered, but merely productiveness of fish, ponds may be formed at the least expence in deep valleys, and slight depressions between hills, where there are rivers or waters; in such situations the principal thing to be attended to is the construction of the banks or heads across the valleys in order to keep up the waters, and providing them with suitable sluices. Laying the foundations sufficiently deep should be particularly attended to, and in forming the embankments the clay and earthy materials should, above all things, be well applied and properly rammed and puddled. The heights and strength of the dams or heads will depend on the nature of the situation, and the depth and weight of water pressing against it. The slopes should be the greatest which are next the waters. The water in the pond should always be of the depth of about five or six feet at an average; if not of this depth, weeds and rushes will be apt to grow up, and occasion considerable expence in keeping the pond clean. Where one pond only is made, and it is desired that as many different kinds of fish as possible should breed and thrive, nature must be assisted by making artificial bottoms, that is to say, one part of the bottom should be of one kind of soil, and another part of another kind of soil, as different species of fish prefer different bottoms.

In order that the ponds may be cleaned of weeds and mud with as little difficulty and expence as possible, they must be so constructed that they may at certain seasons be entirely emptied of water. This may be done in various ways: the easiest and that which may be effected at the least expence, is to fix in the embankment at the lowest end, a wooden sluice, by which the water may be drawn off. Where it is desirable that the pond should appear as a continuous sheet of water, it may be found expedient for the sake of cleaning, to raise in the middle, or at some convenient part, another embankment. This middle embankment is to be raised only to the height of about two feet *below* the general surface of the water in the pond when full, so that a pleasure boat, where such is kept, may pass over the embankment. By this contrivance, one half of the pond is emptied at one time, and the fish are transferred from the one to the other in the time of cleaning. No trees, except osiers or willows, should grow very near the pond, as the fallen leaves and rotten wood are pernicious to the fish; as is likewise water running from dunghills, stables, and wash-houses.

After the ponds are formed, they may be stocked with fish, taken by the net from the nearest rivers or ponds. Great care is necessary in catching the fish, that they be not bruised or hurt in taking them out of the net. If the fish are brought from a distance in casks, the water must be regularly changed every six hours at the farthest, and always kept in motion.

The kinds of fish most desirable for ponds are, the carp, tench, perch, gudgeon, eel, and pike.

1. *The Carp* (*Cyprinus carpio*), is perhaps one of the best fish that can possibly be introduced into a pond: it breeds often, and its young are also numerous, hardy, and grow very rapidly. The female however it is said, does not breed until she attain the age of about eight years; the male being mature at about five years. It is therefore proper in stocking with carp, to take care that some of them be of full size, so as to insure a speedy increase in the pond. It feeds on herbs, fat earth worms, and aquatic insects. They spawn from May to July.

2. *The Tench* (*Cyprinus tinca*), agrees almost in every particular with the carp. These two fish may be kept with safety, in the same pond. The Tench grows quickly. Is very

fertile and very tenacious of life, living under the ice in the severest winters. It feeds on worms and water plants.

3. *The Perch* (*Perca fluviatalis*), is an excellent fish, but considered very ravenous, often devouring its own spawn and always that of others, and therefore it is not desirable to keep them with other fish. It is very prolific, eagerly takes a bait, and feeds on aquatic insects, and smaller fish. Spawns in May and June.

4. *The Gudgeon* (*Cyprinus gobio*), is very inferior to the carp or tench, but being very fertile and of easy culture, it is kept in many places as food for pike and perch. It feeds on worms, insects, the fry of other fish, and parts of carcasses.

5. *The Eel* (*Muræna anguilla.*)—It will thrive and breed in every place, grows sometimes to the length of six feet, and has been known to exceed twenty pounds in weight.

6. *The Pike* (*Esox lucius*).—It inhabits most of the lakes of Europe, is considered by all very ravenous, and ought never to be kept along with other fish. A single pike, however, has sometimes been put into a pond, with a view to keep down the small fish when they were too numerous. It feeds on almost any thing that comes in its way, even its own tribe. It is sometimes put into deep ponds in which some gudgeon only have been introduced for its food. Spawns from February to April.

There are other small fish which are useful as affording food to other fish, as the *Minnow* (*Cyprinus Phoxinus*), the *Dace* (*C. Leuciscus*), and the *Roach* (*C. rutilus*), and are therefore put into fish ponds for the above purpose. They are also very good eating.

With respect to the feeding of fish it is not necessary to say much, for fish when once put into ponds with care and attention, need little support in the way of aliment beyond what the pond naturally affords.—In severe frosts in winter, where the water is not very deep, it may be advisable frequently to break the ice, in order to allow air to reach the fish. It is advisable also to suffer a portion of the sides of the pond to become covered with aquatic plants, for here vast quantities of animals and insects will be produced, forming delectable morsels for the fish.

FLAX.

Flax (*Linum usitatissimum*), Pentándria Pentagy'nia, Linn.; and Caryophŷlleæ, Juss.

The flax is scarcely superior in appearance to common grass except when in blossom, when it certainly presents a most beautiful appearance; yet on no other vegetable has the ingenuity of man been so extensively employed or exerted with such success.

The legislature of the country has paid more attention to framing laws regarding the husbandry of flax, than to any other branch of rural economy; but it need not excite surprise that these laws, even though accompanied with premiums, have failed to induce men to act in a manner contrary to their own interest. The fact is, the culture of flax is found on the whole less profitable than the culture of corn. It is one of the most severe crops when allowed to ripen its seed, but by no means so when pulled green.

Culture, &c.

SOIL.

Newly broken up ground of the alluvial kind, and deep friable loam containing decomposed vegetable matter, are best suited for the culture of flax. The soil should be neither too rich nor too poor; in the former case it grows too luxuriantly and becomes coarse, in the latter case, the plants grow weakly and afford only a small produce.

PROPAGATED.

1. *By seed*, sown in the last week of March or within the first ten days of April. The quantity of the seed depends on the intention of the crop; if for seed, six pecks per acre will be required; and if for flax, from eight to ten pecks per acre will not be too much.

2. The seed is almost always sown broad-cast, except where the production of the seed is the object of the cultivator, then drilling may be advantageously adopted.

3. The place of flax in a rotation of crops is various, but in general it is considered as a corn or exhausting crop, when the seed is allowed to ripen; and as a green, or pea, or bean crop, when the plant is pulled green. Flax, Donaldson observes, is sown after all sorts of crops, but is found to succeed best on lands lately broken up from grass. In Scotland, the most skilful cultivators of flax generally prefer lands from which one crop of grain only has been taken, after having been several years in pasture. When such lands

have been limed or marled, immediately before being laid down to grass, the crop of flax seldom or never misgives, unless the season prove remarkably adverse. In the north of Ireland, flax is generally sown by the small farmers after potatoes. In Belgium, it is supposed not to do well after pease or beans, nor to succeed if sown oftener on the same soil than twice in nine years.

4. The preparation of the soil when grass land is intended for flax, consists in breaking it up as early in the season as possible, so that the soil may be duly mellowed by the winter frosts, and in good order for being reduced by the harrows when the seed process is attempted. If flax is to succeed a corn crop, the like care is required to procure the aid of frosts, without which the surface cannot be rendered fine enough for receiving the seed. Less frost however will do in the last than in the first case, therefore the grass land ought always to be earliest ploughed. At seed time, harrow the land well before the seed is distributed, then cover the seed to a sufficient depth by giving a close double tine of the harrows. Water-furrow the land, and remove any stones and roots that may remain on the surface, which finishes the seed process.

Plant.

1. The after culture of flax consists chiefly in weeding, but sometimes it commences with rolling the surface, which is a very proper operation when the soil is very dry, the season advanced, or the earth very porous. By this process the earth is pressed firmly to the seeds, and they are thereby stimulated to vegetate sooner, and the drought is kept out. On some soils, and in wet and stormy seasons, flax is apt to be laid, to guard against which some cultivators run across their flax field slender poles fixed to stakes; but a better method is to run small ropes across the field, both lengthwise and breadthwise, where necessary; for these being fastened where they intersect one another, and supported by stakes at due distances, form a kind of net work, which is proof against almost every accident that can happen from tempestuous weather. In Scotland a crop of flax is sometimes weeded by turning a flock of sheep at large into the field. They will not taste the young flax plants, but they carefully search for the weeds, which they devour.

2. When grown for the fibre, it is usual to pull the flax when in full blossom; but when for seed, or seed and fibre conjointly, it is never pulled until the seeds in the capsules acquires a brownish colour.

Prepared for the Manufacturers.

1. *By steeping or watering* in order to loosen the bark and separate it from the stalk; this is effected by tying the flax into small sheaves or bundles, and then placing them in a pond or reservoir of soft water, and keeping them down by stones, or any other heavy bodies: in the course of seven or eight days the rind will be sufficiently loosened, and they must be taken out of the water, spread abroad and dried. In this part of the operation, great skill and attention are necessary; for if it be left in the water too long, the threads become rotten, and useless to the manufacturer; it is therefore more advisable to take it out *too soon*, than to leave it *too long* in the pits; which has the same effect in drawing the oil from the flax, has ripening the seed has.

2. *By dew retting*; this process consists in spreading the flax upon grass lands, and exposing it to the constant action of rain and dew. By this process, which is far more tedious than that of steeping, the bark is equally separated from the stalk.

3. Steeping flax in hot water and soft soap (said to be the invention of Lee, and for which he was granted by Parliament, a secret or unenrolled patent), is said to separate the fibre from the woody matter better than steeping in water; and this in the short space of two or three hours, and with green flax, or such as has been dried and stacked for months or years.

4. *Grassing or Bleaching flax* is the next operation, the intention of which is to rectify any defect in the watering process, and carry on the putrafective process to that point when the fibre will separate from the bark, boon, reed, or harl (as the woody part of the stem is called) with the greatest ease. In performing this operation the flax is spread very thin on the ground, and in regular rows; the one being made to overlap the other a few inches, with a view of preventing as much as possible, its being torn up and scattered by gales of wind. Old grass ground, where the herbage does not grow to any great height, is the best for the purpose; as when the grass or weeds spring up so as to cover the flax, it is frequently rotted, or at least greatly injured thereby.

5. *Ripling.*—Those who raise flax for the seed and stalk both, go through an operation called *Ripling;* this is separating the seed from the stalk, by passing the flax through a kind of comb before it is watered. These combs are made of iron, and the teeth are so close, that the beads cannot pass through, and are consequently pulled off.

Others beat the seed out in the field where it grew, by a piece of wood on a stick, (more heavy than the common flail) and the seed is sifted clean into a large sheet.

Use.

1. From its fibrous bark we procure the comfort of linen and the beauty of lace; its very rags, as Phillips observes, are manufactured into the most exquisite of all luxuries, viz. the paper that enables distant friends to hold converse, and communicates the wisdom of the learned of every age and language.

2. The seeds by expression yield an oil (linseed oil), which is extensively employed by painters.

3. The husks of the seed which remain after the extraction of the oil, is sold for fattening cattle, under the name of oil cake.

4. The inferior seed not fit to crush, is, when properly boiled and prepared, used for feeding cattle, and is said to be very nutritious. It is called flax seed jelly; the process for making of which is as follows:—The proportion of water to seed is about seven to one: having been steeped in part of the water eight and forty hours previous to the boiling, the remainder is added cold, and the whole boiled gently about two hours, keeping it in motion during the operation, to prevent its burning to the boiler; thus reducing the whole to a jelly-like, or rather a gluey or ropy consistence. After being cooled in tubs, it is given with a mixture of barley meal, bran, and cut chaff; a bullock being allowed about two quarts of the jelly per day, or somewhat more than one quart of seed in four days, that is about one sixteenth of the medium allowance of oil cake.

5. The seed when ground, forms a mealy powder (linseed meal), and is extensively employed for making cataplasms, &c.

6. A slight infusion of the seed (linseed tea), forms a useful diluent in diseases of the chest and nephritic complaints.

7. In its green state, immediately after the seed has been taken from it, it forms an excellent covering for houses, to be surpassed by few others. It should be put on in a new state, and sowed together with a cord well impregnated with tar. In short time it will throw out a glutinous matter, make the contiguous stalks adhere to each other, and form a solid body, impervious to the sun, wind, and rain.

8. The lint made from linen rags has ever been in great use in surgical cures, from its softness, smoothness, and flexibility; whereas that made from cotton can never be used about wounds, on account of its denticulated parts, which irritate and dispose to inflamation.

FLORICULTURE.

The beautiful lustre and gaudy tints which adorn the vegetable creation, have always rendered the cultivation of flowers an object of attraction and emulation among all classes of society: and surely this is a wise ordination,—for, whilst man is engaged in such rational pursuits, the asperities of his nature are softened and subdued, and his mind is rendered susceptible of the tenderest emotions, and most delightful associations; for who can pass even the poor man's cot, where the hand of industry has tastefully entwined the rose, the honeysuckle, and the briar, around the very threshold of his home, without associating in his mind the idea of comfort and of happiness within; whilst, on the other hand, if the weeds of indolence are seen towering in luxuriant growth over the loveliest gems of Flora's Temple, choaking up, as it were, the very approaches of his habitation, he concludes with emotions of regret, that waste and prodigality are the inmates there. Besides, in contemplating the beautiful works of creative power, the mind is insensibly led to

> "Look through nature up to nature's God:"

For

> "Not a tree, a plant, a leaf, but contains
> A folio volume. We may read, and read,
> And read again: and still find something new;
> Something to please, and something to instruct,
> Even in the humble weed."

The taste for flowers, therefore, cannot be too extensively encouraged, and especially among the labouring poor, for unless a man has attachments that endear him to his home, his leisure hours will be too frequently spent in revelry abroad, whilst his family is suffering from want and penury at home.

To have entered more fully upon a subject so replete with interest as this, would have indeed afforded us a delightful occupation, but some particu-

lars relative to the cultivation and arrangement of a few perennial plants, calculated equally to adorn the farmer's court-yard, the tradesman's villa, and the labourer's cot, are all that can be effected in the limits assigned us.

In treating of the cultivation of plants for the flower garden, it is customary to divide them into two classes—

The First Class, comprehending those Herbaceous Flowers, which from the hardiness of their nature and showy appearance, are well calculated for display in the general or mingled flower border.

The Second Class, comprising those flowers only which from their beauty or rarity, are most advantageously cultivated in select flower beds.

The former will require our first attention:

1. *The Flower Border.*

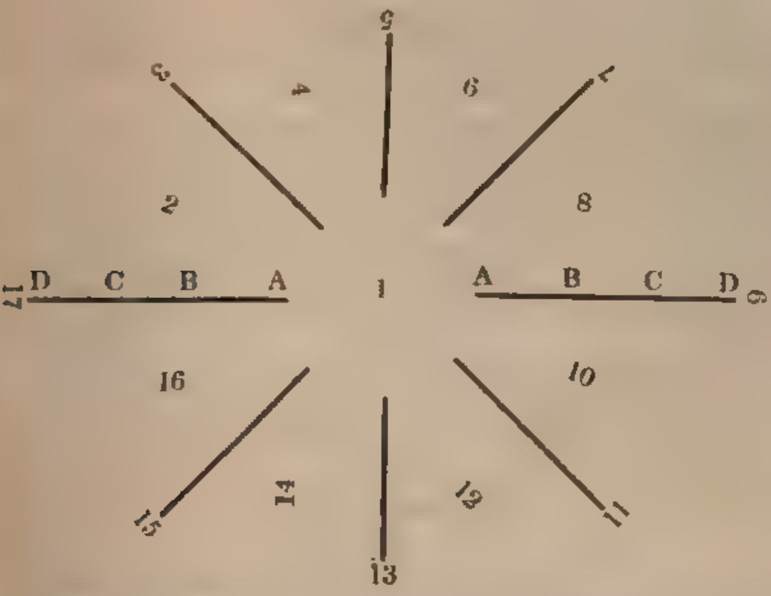
The *form* and *extent* of the flower border, must necessarily depend upon local circumstances, and the particular taste of the cultivator, but whatever figure is adopted, whether circular, quadrangular, or oval, the preparation of the soil, and the general distribution of the plants, will in every case be the same; the great desideratum being, a gay assemblage of flowers, so arranged with regard to their respective heights, colours, and periods of flowering, as to produce a brilliant display, and constant succession of bloom, during the whole of the flowering season. In the choice of a good selection of plants, considerable taste and judgment are required: the following tables, embracing all the desired requisites, have been kindly furnished us by our intelligent contributor, Mr. Nicol, of Newick Place.

The *first column* of each table contains the common name of the plant; in the *second* its systematic name is given. The numbers in the *third column*, refer to the corresponding numbers in the diagram, pointing out the situation of the plant in the flower border. The *fourth column* shows the colour of the blossom, while the *fifth* indicates the period of its duration, and the *sixth* its mode of propagation. The following abbreviations are employed in the last column:—C, cuttings; D, division of the plant or root; L, layers; O, offsets; S, seed; Sk., suckers.

2. *Soil, Preparation of the Flower Border, and general distribution of the Plants.*

Most herbaceous plants will succeed in any common garden soil, provided it is sufficiently light, dry, and mellow. Previous to the time of planting, the whole border should be well trenched, and afterwards the surface raked smooth and even, so as to form a gradual slope or inclination from the centre to the margin of the border. Thus prepared, the centre, (fig. 1, diagram), may be occupied by a Lauristine, (Vibúrnum Tínus); or, if preferred, one of the following plants:—Japan Quince, (Cydónia Japónica); Azalea, (Azálea Póntica); Rhododendron (Rhododéndron Pónticum); Ever-blowing Rose, (Rósa Semperflórens.)

The general distribution of the plants in the flower border will be better understood by means of the following diagram:



An imaginary line drawn from the centre to the margin of the border, may be conveniently divided into four parts, constituting four principal divisions, as A, B, C, D. The tallest flowers of the series must be planted in the first division, A; the next in gradation, will occupy the second division, B; the same of the third division, C, and so of the fourth division, D; in which the plants of the humblest growth or stature should be planted. The first desideratum is now attained—the proper distribution of the plants according to their respective heights: the second refers to their relative position in the flower border, in connexion with their periods of flowering, and colour of their blossoms.

How this is to be effected, the mere inspection of the following tables will clearly indicate; one example, by way of illustration, will shew their application. On referring to the *first column* of Table I. which contains the tallest plants of the series, we find the common name of the plant inserted, viz, the *Cardinal Flower;* its systematic name follows—*Lobé lia Cardinális.* The *third column* points out its proper situation in the flower border, (fig. 13, division A); but if our example had been taken from the second plant in the last Table, viz—the *Meadow Saffron*, we should have found a double series of figures, in the third column, as 14.15, which shews the Meadow Saffron is to be planted in the margin of the border, *between* the numbers 13.14 in the diagram. But in reference to our former example, the *fourth column* indicates the colour of the blossom, which is *scarlet*. The *fifth column* points out its probable duration, that is, from *May* to *September*: and, the *last column*, its peculiar mode of propagation, viz by *cuttings*.

TABLE I.

FIRST DIVISION (A.)

English Name.	Systematic Name.	Situation on Flower Border.	Colour of Blossom.	Time of Flowering.	Mode of Propagation.
Cardinal Flower	Lobélia Cardinális	13	Scarlet	May Sept.	D
Meadow Rue	ThalíctrumAquilegifólium	15	Purple	May July	D
Tiger-spotted Lily	Lílium Tigrinum........	17	Orange	July Sept.	O
Perennial Flax..........	Línum Perénne	3	Blue	June Aug.	D
Shrubby Œnothera	Œnothéra Fruticósa	5	Yellow	June Aug.	D
Entire-leaved Pæony	Pæónia Corallína........	7	Red	May June	D
Pyramidal Phlox........	Phlóx Pyramidális	9	Flesh	July Aug.	D
Great-flowered Larkspur	Delphínium Grandiflórum	11	Purple	June Sept.	D

TABLE II.

SECOND DIVISION (B.)

English Name.	Systematic Name.	Situation on Flower Border.	Colour of Blossom.	Time of Flowering.	Mode of Propagation.
Crown Imperial	Fritillária Imperiális	14	Yellow	Mar. April	O
Scarlet Lychnis	Lychnis Chalcedónica....	16	Red	June July	D
White-flowered Phlox ..	Phlóx Suavéolens	2	White	July Aug.	D
Valerian	Valeriána Rúbra........	4	Red	May June	D
Smooth Perennial Lupine	Lupínus Perénnis	6	Blue	May July	D
European Globe Flower..	Tróllius Europæ'us......	8	Yellow	May June	D
Clove Pink	Diánthus Caryophíllus ..	10	Red	June Aug.	C
Rose-bay Willow Herb ..	Epilóbium Angustifólium	12	Purple	July Aug.	D

TABLE III.

THIRD DIVISION (C)

English Name.	Systematic Name.	Situation on Flower Border.	Colour of Blossom.	Time of Flowering.	Mode of Propagation.
Grass-leaved Anthericum..	Anthéricum Liliágo......	13	White	May June	Sk.
Early-flowering Phlox ..	Phlóx Divaricáta	14	Blue	April June	D
Red-flowered Chelone ..	Chelóne Oblíqua........	15	Purple	Aug. Oct.	D
Great-flowered Bell Flower	Campánula Grandiflóra ..	16	Blue ..	June Aug.	D
Wood Anemone	Anemóne Nemórosa	17	White	March May	D
Sweet-scented Tagetes....	Tagétes Lúcida..........	2	Yellow	July Nov.	D
Sweet William Pink	Diánthus Hy'bridus......	3	Red	July	C
Venus' Navel Wort	Omphalódes Vérna......	4	Blue	Mar. April	D
Scarlet Chelone..........	Chelóne Barbáta	5	Scarlet	June Sept.	D
White-flowered Chelone..	Chelóne Glábra	6	White	Aug. Oct.	D
Fumitory	Fumária Nóbilis	7	Yellow	June	D
Crimson Cinquefoil......	Potentílla Atro-sanguínea	8	Purple	May Sept.	D
Sweet-scented Colt's Foot	Tussilágo Frágrans......	9	White	Jan. March	D
Monkey Flower	Mímulus Lútea Rivális ..	10	Yellow	July Aug.	D
White-flowered Day Lily..	Hemerocállis Japónica ..	11	White	Aug. Sept.	D
Canadian Columbine	Aquilégia Canadénsis	12	Yellow	April May	D

TABLE IV.

FOURTH DIVISION (D).

English Name.	Systematic Name.	Situation on Flower Border	Colour of Blossom.	Time of Flowering.	Mode of Propagation.
Red Hepatica	Hepática Tríloba Rúbra	13	Red.	Feb. April	D
Meadow Saffron	Cólchicum Autumnále	13.14	Purple	Sep. Oct.	O
Christmas Rose	Hellébours Niger	14	Pink	Jan. March	D
Winter Aconite	Eránthis Hyemális	14.15	Yellow	Feb. March	O
White-flowered Dog's Tooth Violet	Erythrónium Albiflórum	15	White	Feb. March	O
Alpine Wall Flower	Cheiránthus Alpínus	15.16	Yellow	May June	C
Bloody Crane's Bill	Gerānium Sanguíneum	16	Red	June Sept.	D
Cloth of Gold Crocus	Crócus Susiánus	16.17	Yellow	Feb. March	O
Star Anemone	Anemóne Horténsis	17	Var.	April May	D
Blue Hepatica	Hepática Tríloba Cerúlea	17.2	Blue	Feb. April	D
Woodroof	Aspérula Odoráta	2	White	May June	D
Dwarf Gentian	Gentiána Acaúlis	2.3	Blue	March May	D
White Round-leaved Bell Flower	Campánula Rotundifólia flor. alb.	3	White	July Aug.	D
Dwarf Œnothera	Œnothéra Púmila	3.4	Yellow	May Sept.	D
Common Snow Drop	Galánthus Nivális	4	White	Jan. March	O
Heart's-ease	Viola Tricolor	4.5	Purple	May Sept.	D
Barrel Flowered Gentian	Gentiána Saponária	5	Blue	Aug. Sept.	D
Doub. Brimstone Primrose	Prímula Pléna Súlphurea	5.6	Yellow	March May	D
Dog's Tooth Violet	Erythrónium Dens Cánis	6	Purple	March	O
Neapolitan Violet	Viola O'doráta Pállida Pléna	6.7	Blue	March May	D
Alpine Brook Saxifrage	Saxifrága Rivuláris	7	White	June July	D
Dwarf Bell Flower	Campánula Púmila	7.8	Blue	July Aug.	D
Lancashire Crane's Bill	Gerānium Lancastriénse	8	Purple	April Oct.	D
Party-colored Crocus	Crócus Versícolor	8.9	Var.	Feb. March	O
Common Cylamen	Cy'clamen Europæ'um	9	Red	August	S
Scotch Crocus	Crócus Biflórus	9.10	White	Feb. March	O
Dwarf Iris	Iris Púmila	10	Purple	April May	D
Double Red Primrose	Prímula Vulg. pl. Rúbra	10.11	Red	March May	D
Double Purple Violet	Viola Odoráta Purpúrea Pléna	11	Purple	March May	D
White Hepatica	Hepática Tríloba Alba	11.12	White	Feb. April	D
Double-quilled Daisy	Béllis Horténsis Fistulósa	12	Red	March Aug.	D
Double White Primrose	Prímula Vulg. pl. Alba	12.13	White	March May	D

3. *Propagation of Perennial Herbaceous Plants.*

Most herbaceous plants may be propagated by one or the other of the following methods:

1. By Seed.

This mode is principally applicable to those kinds that cannot be freely propagated by offsets or cuttings. The general season for sowing is the spring, during the months of March and April, and occasionally the beginning of May; some sorts, however, require sowing in the autumn so late as August or September.

The seeds may be sown either broad-cast and raked in lightly, or in shallow drills lightly covered with mould, from a quarter of an inch to half an inch in thickness, according to the nature of the seed As soon as the plants have advanced two or three inches in height, they should be planted into nursery beds six inches apart, or removed at once into the flower border where they are to remain.

2. By Cuttings of the Stalks or Side-shoots.

Some of the more delicate herbaceous plants are propagated in this way, as the Scarlet Lychnis, Wall Flower, and a few others. Young tender shoots are generally taken in June or July, as soon as they are ready, and planted in a shady border composed of sandy loam. Some of the more delicate species require the protection of a hand-glass.

3. By Suckers or Offsets.

By far the greater number of herbaceous plants may be propagated in this manner. The offsets or suckers may be carefully detached during the spring months, or early in the summer, and immediately planted either in the flower border or the nursery department. By pinching off their flower-buds they will flower much stronger the preceding summer.

4. By Dividing the Root.

This is effected by taking up the plants, and dividing them into as many portions as there are separate crowns; or the earth may be partially removed, and as many crowns detached as may be wanted, each section constituting a new plant. This operation may be performed in the spring, or otherwise deferred till the autumn, after the plant has flowered.

5. By Layers.

This operation is more strictly applicable to the tree and shrub than herbaceous plants in general, but there are a few that cannot be successfully propagated by any other means, as the Double Carnation, Double red and variegated Sweet Williams, and some curious varieties of Pinks. The operation is generally performed in the months of June and July, just as the plant is beginning to flower. The layers are generally well rooted in about six weeks or two months from the time of laying, they must then be carefully separated from the parent plant, and disposed of in nursery beds, or in the flower border, where they are to remain.

All the species of herbaceous plants which the foregoing Tables embrace, may be readily procured from any of our Nursery Gardens. The spring offers the best season for their removal, any time in the months of February, March, or April, before the plants are much advanced in growth. Sometimes however they are removed in the autumn, after the flowering season is past, from the middle of September to the middle or latter end of November.

In the general management of the flower border both time and attention are required, the surface must at all times be kept perfectly free from weeds, occasionally dug, and frequently hoed; the taller plants, as they advance in height, must have efficient support afforded them to prevent their receiving injury from the wind and heavy rains; those that assume a straggling growth must be pruned to proper limits, dead leaves and decayed branches removed as soon as discovered, and every attention paid to order, regularity, and neatness.

To fill up vacancies produced by the early flowering of some of the bulbous plants and spring flowers, a few hardy annuals may be sown on circular patches on different parts of the border in the month of March; these must be thinned as they advance in growth, allowing as many of the strongest plants to remain as circumstances may require.

It remains for us now to offer a few remarks upon the cultivation of those choice flowers to which custom has assigned select beds for their individual propagation and display. The form and extent of the beds and general disposition of the flowers, must necessarily depend upon local circumstances and the prevailing taste of the cultivator, but when taste in the conception, and ability in the execution have been happily combined, the effect produced is truly imposing. The authoress of the "Florists' Manual," however, objects to this display of beauty in masses, for in making a comparative estimate between the effect produced by a display of flowers in separate beds and the mingled flower border, she remarks—"In the formation of that assemblage of flowers which may be distinguished by the term mingled flower garden, it is essential that the separate parts, should, in their appearance, constitute a whole; and this appearance is not incompatible with any form in which the ground may be thrown, if attention be given to the manner of planting. In some gardens, this appearance of a whole is entirely destroyed by the *injudicious taste* of setting apart *distinct borders* for pinks, hepaticas, primulas, or any other favourite kind of flowers; also for different species of bulbs, anemones, ranunculuses, hyacynths, &c., these distinct borders, though beautiful in themselves, break that whole which should always be presented to the eye by the mingled flower garden, as single beds containing one species only, form a *blank* before that species produces its flowers, and *a mass of decaying leaves*, when the glow of their petals is no more." To a certain extent these objections are true, for nothing can be more unsightly than a mass of decayed leaves, but this objection may, in a great measure, be remedied by adopting Mr. Nicol's plan of introducing new plants in the room of those that have previously flowered, and thus a succession of bloom and uniformity of effect, will be constantly maintained during the whole of the flowering season.

To make ourselves clearly understood, we must again refer to our former diagram, in which figures 2, 4, 6, 8, 10, 12, 14, and 16, may be considered a series of beds circumscribing one common centre, fig. 1.

Thus arranged they may be disposed of in the following manner:—

The central bed, fig. 1.—A bed of roses with a border of mignionette.

Fig. 2.—A bed of Lobelias, planted eighteen inches apart, intermixed with Schizanthus Pinnatus, sown in April and planted out in May.

Fig. 4.—A bed of Ranunculuses, these will be ready to be taken up in July, and may be succeeded by Turnsoles (Heliótropium Peruviánum).

Fig. 6.—A bed of Tiger Lilies, planted eighteen inches apart. China Asters may be sown in May, and thinned out to proper intervals as they advance in growth.

Fig. 8.—A bed of Anemones, succeeded by Geraniums.

Fig. 10.—A bed of Mexican Tiger Flowers (Tigrídia Pavónia), these should be planted out in May a foot apart, sowing at the same time some seeds of the Double Larkspur.

Fig. 12.—A bed of Tulips, these may be taken up in June, and succeeded by Clarckias (Clárckia Pulchélla), planted a foot apart.

Fig. 14.—A bed of Georginas (Dahlias), with a border of Mignonette. The Georgina or Dahlia is a splendid autumnal flower, and few cottage gardens are now to be found without possessing this universal favourite; its cultivation is nearly as easy as that of the potatoe; it may be planted in the open air in March or April, when all danger of severe frosts are over; and in the autumn when the flowering season is past, the tubers should be taken up and carefully preserved from the frost by placing them in dry sand, or they may be properly covered with straw and mould in the same manner as potatoes are preserved; this mode of cultivation is only applicable to the common garden; but in the flower bed, where an early display of blossom is so desirable, the tubers must be planted early in the spring, in pots six inches in diameter, and kept in a house or frame till all danger of frost is over, when they may be planted out.

Fig. 16.—A bed of Fuchsias with a border of Commelinas (Commelína Tuberósa.) The Fuchsias must not be pruned till spring; and the Commelina, formerly treated as a stove plant, will stand our winters if properly protected by mulching.

The above list embraces many of our choicest flowers, and all the art and skill of the professed florist will be required for their successful cultivation; such details, however, are quite incompatible with the nature of our present undertaking, and as we have already exceeded our prescribed limits, the reader must be content with the following extracts from a recent publication, "The Florist's Directory," on the Crown Anemone and Garden Ranunculus.

Crown Anemone.

"The anemone is propagated and new varieties are obtained by sowing the seed. This should be chosen from semi-double flowers, having the desirable properties of rich colour and fine form. The seed being volatile should be gathered as it ripens, and preserved in a dry place till the month of January, when it should be sown. It requires to be prepared for sowing by being mixed with and well rubbed in sand, to divest it of its downy covering. The seed-bed should be composed entirely of fresh garden ground or loam, from twelve to eighteen inches deep, which has been well aerated to free it from earth worms and other insects; and for the better security against these, a layer of quicklime, three inches thick, should be laid in the bottom of the bed; and to prevent the approach of slugs or worms to the surface, the outskirts of the bed should be frequently sprinkled with lime or salt water. A shallow one-light frame is necessary for the defence and nurture of seedlings. In this, when the soil is settled and levelled, sow the seeds thickly and equally, and press them into the earth with a board or back of a spade.

The seed should be kept rather moist. While the seeds are vegetating the light should be kept close, and as they swell and force themselves above ground, a slight covering of loam may be sifted on from time to time, till the seeds are hidden. Air must be given on all occasions when the weather permits, as soon as the plants begin to appear; and should the bed become too dry, it must be lightly watered. If the surface appears crusted when the seedlings are rising, it must be cautiously loosened with the point of a stick, to give freedom to the plants. This treatment must be continued till the leaves begin to die off, and when they are quite withered the tubers may be taken up.

As these small roots are irregular in form, and of a dingy colour, they are not readily found, unless two or three inches of the surface be passed through a fine brass wire sieve, to separate them from the mould. A more expeditious way is by washing it away in water: for this purpose a wide tub of water is used, the sieve containing the mould and roots, partly emerged in this is trundled; the earth falls through, leaving the roots to be picked out, dried, and stowed away in a proper place; to be planted in due season. These seedlings, planted in a nursery bed, will, for the most part, flower the second year; all that are worthless may be discarded, and the best only kept to propagate from, or take a place among the superiors. The finest double varieties are only procurable by a long course of successional sowings from individuals of good colour, and which show a tendency to become double.

The anemone may be also propagated by dividing the tuber. When this becomes old, it rots in the centre; but as the vital crowns are dispersed over the surface, any portion thereof, however small, containing a crown, if separated and planted, becomes a new plant.

The "vis inertia" or sleep of the anemone, enables the florist to commence its seasons at any period during the autumn and winter months. Were he to imitate nature closely, he would invariably chuse the month of October as the most proper in this country, because they get into action before the hardest frost sets in, and which is considered as no

small security; and though they must brave all the severity of winter, still, if they receive that protection which it is the business of the florist to afford, they will succeed better than if they had an artificial season forced upon them by deferring the planting for two or three months.

But it is argued, that the frequent covering required to repel the frost, is not only highly injurious, but even risks the existence of the plant; and therefore some persons prefer spring planting as the safest practice. But it should be remembered that the anemone is a winter, not a spring plant; requiring, in its own climate, a season of at least five months continuance; whereas with us, if planted in February, it has only a season of three months, which is too short a period to allow the full developement of the flowers and necessary enlargement of the tuber; the sudden arrival of our summer checks the growth, and hastens on a premature torpidity. I am therefore decidedly of opinion, as well from the nature of the anemone itself, as from the concurring testimony of many successful growers, that the middle of October is the proper time for planting. The hazards of the winter must be guarded against with requisite attention, by defending the bed from severe frosts, without depriving it of a full portion of air. How this may be done, requires only a few words. Few persons, acquainted with the effects of frost on vegetation, but are aware that *cold air* descends perpendicularly, or, as it is explained by some meteorological writers, *heat* is radiated from the earth vertically. Heat a positive, and cold a negative quality, do not from their effects, appear to be *much* diffused laterally. A coping on a wall defends the fruit trees under it: a thin mat will repel frost that without its interposition would have been fatal: a dense cloud floating high above the earth, shelters the ground and plants below. Coverings for anemones, therefore, should be placed at some distance, (say two feet above the surface of the bed); the sides being left open for the admission of air, except in frosty winds, (called black frosts), a curtain should be added, on the windward side. Stakes driven in the ground, and connected by a surrounding rail, will serve to bear straw mats of sufficient thickness, to be rolled on and off as they are needed, which will be protection enough.

The habits of the anemone, as being a production of the moistest season of the year, seems to point out the soil most congenial to it; viz—a mellow, rich loam. The success of many cultivators who have published their experience, yields ample proof, if proof was wanting, of the suitableness of such soil. It is such as absorbs and retains an equable degree of moisture, without repletion or deficiency: and, though surface-water be neither naturally necessary nor suitable, yet a substratum of rich and permanently humid soil, appears to be indispensable.

In forming the bed, therefore, the florist has only to loosen the bottom sufficiently deep, and about eight inches from the surface, let strong loam and rotten dung be mixed, to form the sub-stratum, and on this a surface-layer of lighter loam, to receive the tubers.

The bed being formed and levelled, drills are drawn across, about five inches asunder, in which the roots are placed, crowns upwards, four inches or more apart, according to their size, and covering them as near as possible about two inches deep. Sometimes sand is strewed under and over the tubers, but this is not absolutely necessary.

Having already adverted to the winter management, the next thing in course is, what should be attended to before and at the time of flowering. If the winter has been mild, and without much frost and snow, and all other circumstances favourable, the plants in the course of the spring will be looking well. If the month of March, as sometimes happens, has been dry, the bed should be examined; and if the surface has become loose, it should be stirred, and a little fresh loam added and pressed close to the plants. The subsoil should also be examined; and if it appears not sufficiently damp, a good soaking of manured water should be immediately given. It is wrong to wait for indications from the leaves, of a want of water, because leaves attached to a bulb or tuber, show a vigour which does not entirely arise from the state of the soil; and therefore the soil should be examined and treated accordingly. If insects of any kind have taken possession, they should be dislodged.

When approaching to flower, unless sufficient rain has fallen, occasional watering may be necessary; and as they come foward in bloom, both shading and watering will be required.

If the weather at this time be fine and dry, the tubers, after flowering, will ripen regularly of themselves; but if cold and wet, it will be necessary to protect the bed from rain: otherwise the tubers will be kept in a state of excitement, and be thereby enfeebled for future exertion. This is a material point in the culture of the anemone, and deserves particular attention. It seems that our summer should resemble their own; that is, to commence so as to stop their growth instantaneously, and allow the tubers to ripen in perfect drought. Checking all growth by such means, the leaves will soon begin to change colour, and about a month after the bloom, the roots may be taken up, carefully cleaned, dried, and stored up."

Ranunculus.

"There are only a few particulars in which the management of the ranunculus differs from that of the anemone. The first is in preparing the seed for saving, which, instead of being separated by rubbing amongst sand, is scraped from the receptacle with a blunt knife,

dividing it so as not two or more remain together in the husks. The next particular is in the planting; that care be taken not to bury the tubers deeper than an inch and a half. The bed, too, besides the natural tendency of such a compost to settle closely together, should be compacted by the action of the spade, to resist the entrance of air, which appears to be unnecessary to the roots.

Before, and when coming into bloom, the surface of the bed should be kept pretty solid and moist, by mulching and occasional watering with manured water. Shading, will preserve and prolong the beauty of the flowers; and all ulterior treatment to be observed as directed for the anemone.

Ranunculus tubers increase themselves by viviparous progeny; but the connecting runner between the old and young plants, is usually so short, that they appear as one, and inseparable. This, however, is not the case: if the runner be cut by the point of a knife, neither the old nor young one will be damaged; and by such means, the kind may be multiplied without end."

J. M.

FURZE.

Furze, Whin or Gorze (*U'lex europæus*), Diadélphia Dec'andria, Linn.; and Leguminósæ, Juss.

The furze is a well-known indigenous shrub, growing abundantly on light soils and elevated situations; scarcely any plant is more brilliant when in blossom, at the same time it exhales a very delightful odour. When Linnæus, the great naturalist, first beheld this plant in blossom in this country, he is said to have fallen upon his knees and offered up a prayer of thanksgiving to the great Author of Nature.

Culture, &c.

Soil.

Will grow in any light dry soil, but the better the land the more luxuriant its growth.

Propagated.

1. *By seed*, sown in February, March, April, or early in May.

2. When cultivated for cattle, Dr. Anderson recommends the following plan, which he has successfully adopted:—" A field of good dry loamy land being well prepared, he sowed along with a crop of barley the seeds of the whin, or furze, in the same way as clover is usually sown, allowing at the rate of from 15 to 30 lbs. of seed to the acre. The seeds, if harrowed in and rolled into the barley, quickly spring up and advance under the shelter of the barley during the summer, and keep alive during the winter. Next season, if the field has not a great tendency to run to grass so as to choke them, they advance rapidly after Midsummer, so as to produce a pretty full crop before winter." This you may begin to cut with the scythe immediately after your clover fails, and continue to cut it as it is wanted during the whole of the winter; but it is supposed that after the month of February the taste of this plant alters, as it is in general believed that, after that time, horses and cattle are no longer fond of it. He however observes, that never having had a sufficiency of whins to serve longer than towards the middle of February or beginning of March, he cannot assert the fact from his own experience. He has frequently seen horses beating the whins with their hoofs, so as to bruise the prickles, and then eat them, even in the months of April and May; and he says that sheep which have been used to this food, certainly pick off the blossoms and the young pods at that season, and probably the prickles also, so that it is possible the opinion may be only a vulgar error. This is, he thinks, the best way of rearing whins or furze, as a crop for winter food for cattle or horses. But for sheep who take to this food very kindly when they have once been accustomed to it, less nicety is required; for if the seeds be simply sown broad-cast very thin (about a pound of seed per acre) upon the poorest soils, after they come up, the sheep of themselves will crop the plants, and soon bring them into round close bushes, as this animal nibbles off the prickles one by one, very quickly so as not to be hurt by them: sheep, however, who have not been used to this mode of browsing do not know how to proceed, and often will not taste them; but a few that have been used to the food, will, he observes, soon teach all the rest how to use it.

Plant.

1. Should be mowed the year after sowing, beginning in October or sooner; it will continue to grow till Christmas, and be fit for use till March.

2. Young plants, or even slips planted in spring or October, will grow with facility.

USE.

1. *As a green food for cattle.*—For this purpose the shoots should not be more than two years old, and they require to be passed between rollers to bruise the ligneous parts and the thorns. It has been tried in this way by a number of agriculturists, and found a highly nutritive food for horses, oxen, and kine.

2. *Horses* are exceedingly fond of it, and eat it as readily as hay; it should be used soon after it has been bruised. Two bushels, with a proper allowance of *hay*, have been found to be sufficient for a day for three horses performing the same labour as with corn.

3. *Cows* that are fed upon it, yield nearly as much milk as while upon grass, which is free from any bad taste.

4. "*Cattle*," says Dr. Anderson, "eat it perfectly well when thoroughly bruised, and grow as fat upon it as upon turnips; but unless it be very well bruised for them, they will not eat it freely, and the farmer will be disappointed in his expectations.

5. It is frequently employed for hedges, but excepting where it occupies a considerable breadth on a raised mould, it does not last long, getting naked at the bottom. If sown on a mound, the sides may be cut and the prunings used as fuel or as green food, and the fence thus rendered close at the bottom as well as durable.

6. When employed as fuel it should not be cut before the third or fourth year Poor hungry gravelly soils which would not have let for five shillings per acre, have been rendered worth twenty shillings, by sowing the furze seed in places where fuel has been scarce; but it is not worth cultivating in places where fuel of any kind is cheap, or upon such lands as will produce grass, corn, or other crops, employed as the food of animals.

GARLIC.

Garlic (*A'llium Sativum*) Hexándria Monagy'nia, Linn.: Asphodéleæ, Juss.

This is a hardy perennial, bulbous-rooted plant, with long linear narrow leaves. It has a root composed of many bulbs, called cloves, from ten to fifteen in number. It flowers in June and July.

Culture, &c.

SOIL.

Garlic succeeds best in a light, rich, dry soil, and one that has not been very recently manured. A fresh hazel loam is, however, well suited to this plant,

PROPAGATED.

By planting the divided cloves of the bulbs, any time from the beginning of February to the beginning of March. Dividesome of the largest roots into separate cloves, plant them singly, in rows, eight inches asunder, and the same distance in the row, and an inch deep, either in drills or in holes, with a blunt-ended dibble, dropping the clove to the bottom, and raking the ground even, to cover inthe holes.

PLANT.

1. The after-culture consists merely in keeping the plants clean and free from weeds.

2. *Taking the Crop.*—The bulbs will be full grown by the end of July, or beginning of August, and the leaves changing to a yellowish colour, is the criterion of their maturity, and may be taken up with perfect safety. They should be spread in the sun to dry and harden, with the leaves and stalks remaining upon the bulbs. They may, after being sufficiently dried, be tied up in bundles, and hung up for use: they will remain good the next spring and summer.

USE.

The cloves of this plant are frequently introduced in culinary dishes; but being of such strong flavour, it is only put into the dish for a short time while cooking, and taken out again after a sufficient degree of flavour has been imparted. They are likewise occasionally used in medicine.

GEOLOGY.

On the Geological Structure of the Earth as connected with Agriculture, by CUTHBERT W. JOHNSON, ESQ. F.L.S., Z.S., and H.S.

Without understanding perhaps a single term in Geology—without even knowing what primitive, secondary, or transition, rocks mean—every tiller of the earth is connected with the Geological structure of the soil he cultivates. In no part of the Agricultural Sciences is so much capable of being accomplished and so little generally effected, as in the careful study and admixture of various strata.

It is true that a farmer is only immediately connected with that strata which directly occurs upon the earth's surface, and to this his sole attention is usually directed without one moment's consideration of the possible advantages which may be derived from the mixture of some sub or neighbouring strata with the top soil;—in fact, with the great majority of farmers, the idea of a manure is usually confined to the product of the farm yard; and if he keeps his dunghills in only tolerable order, he considers that he has accomplished all that it is either proper to expect, or rational to attempt.

The accomplished Agriculturist, however, is by no means satisfied with such a primitive mode of agricultural management. He knows that one earth only does not constitute a fertile soil, however highly manured with animal and vegetable matters—that a soil all clay (called Alumina by chemists), or all flint (Silica), or entirely chalk (Carbonate of Lime), never did grow a good crop, and never will, since chemistry tells him, that each of these earths is absolutely a constituent part of even the commonest grass and of every wheaten straw.

It is, therefore, a paramount object to every Agriculturist to find what earths, of which his soils are deficient, exist either under the surface or in the neighbourhood; and there are few parts of England where important results may not be obtained by a careful attention to this subject.

Thus, suppose we are wishing to improve a soil in which sand is naturally in excess, clay and chalk are the natural additions, for they will render the soil more retentive of moisture; and in fact, this proportionate retention by a soil of the atmospheric moisture, forms one great criterion of the relative fertility of a soil. What modes have been adopted in such a case by farmers to supply the deficiency?

The presence of a clay or a marl pit (marl is a mixture of chalk, clay, and sand), at once supplies the deficiency; in other parts of England, as in Dorsetshire, they dig pits perhaps one hundred or more feet into the ground, and raise the chalk or marl to the surface by a windlass or other machine;—others, as the Essex farmers, bring chalk in sailing barges from the shores of Kent. Other farmers living on the borders of a clay district, fetch chalk or calcareous sand some miles, perhaps taking a load of stiff clay to the sandy soil, and returning with a load of sand or chalk to fertilize the heavy adhesive clays.

Some of the Cornish farmers, especially near to Padstow, fetch a calcareous sand from the sea shore, even on horses' backs, a distance of some miles. The Norfolk farmers do the same from Cromer Beach; and in Suffolk, near Ipswich, they get a red gravelly kind of sand out of pits, and spread it on their soils in great quantities.

There are very few parts of England where some of these expedients cannot be adopted for the improvement of the soil, suggested as they must be, either by the common sense of the farmer, or by combining his views with those of a neighbouring cultivator of another description of soil.

The mode of ascertaining the excesses and deficiences of the earthy constituents of soils, and the means of remedying them, have been more fully developed in the article upon the analysis of soils. A knowledge of Geology is of little immediate importance to the cultivators of the soil. It is, however, not without its interest to them; for it explains in many ways the formation of the earth's surface, with which they are intimately connected.

There is evidence amounting to very strong proof, that the earth has gradually attained its present form by its components accumulating round a nucleus and, as far as our researches have gone, that nucleus appears to have been granite, gneiss, mica-slate, topaz, rock, and other dense chrystalline masses, having a great predominance of silica in their constitution; upon these appear to have formed other compounds of silica, but to these were added primitive limestone, gypsum, porphyry, &c., which contain a predominance of calcareous and aluminous matters; and nearly in all are found the red oxide of iron and magnesia. Of these the earth appears to have been originally formed; and hence these have been named primitive formations. By the convulsions which shook our planet in succeeding ages; by deluges, the universal and partial ones; by volcanic eruptions, and by the gradual but mighty erosions of time; by its agents, the winds and rains; by the electrical influences and transitions of temperature peculiar to the atmosphere, various alterations have been effected in the positions of these formations; and these succeeding arrangements are known to Geologists as secondary, transition, and alluvial strata.

With the primary formations, the cultivator of the soil never has to contend, for they never approach the surface but as barren rocks, bursting as it were through the surface, which, in fact, has been formed by their decay;—they rise as some of the most gigantic mountains of the earth.

The secondary formations, that are familiar to the farmer, as chalk, sandstone, &c., approach nearer to interest him. These are the ruins of the first; and from the ruins of these again, have been formed the soils he cultivates. Sir H. Davy has so well developed this formation, that it would be useless to adopt any other form of narration, as it would be hopeless to improve upon it. "Soils," says that accomplished Atlas of Science, "appear to have been originally produced in consequence of the decomposition of rocks and strata; it often happens that soils are found in an unaltered state upon the rocks from which they were derived. As soon as the smallest layer of earth is formed on the surface of a rock, the seeds of lichens, mosses, and other imperfect vegetables, which are constantly floating in the atmosphere, and which have made it their resting place, begin to vegetate: their death, decomposition, and decay, afford a certain quantity of organizable matter, which mixes with the earthy materials of the rock. In this improved soil, more perfect plants are capable of subsisting; these, in their turn, absorb nourishment from water and the atmosphere; and, after perishing, afford new materials to those already provided. The decomposition of the rock still continues; and at length, by such slow and gradual processes, a soil is formed in which even forest trees can fix their roots, and which is fitted to reward the labours of the

cultivator. In instances where successive generations of vegetables have grown upon a soil, unless part of their produce has been carried off by man, or consumed by animals, the vegetable matter increases in such a proportion, that the soil approaches to a peat in its nature; and if in a situation that it can receive water from a higher district, it becomes spongy and permeated with that fluid, and is gradually rendered incapable of supporting the nobler classes of vegetables. Many peat-mosses seem to have been formed by the destruction of forests, in consequence of the imprudent use of the hatchet by the early cultivators of the country in which they exist. When the trees are felled in the outskirts of a wood, those in the interior exposed to the influence of the winds, and having been accustomed to shelter, become unhealthy and die in their new situation; and their leaves and branches gradually decomposing, produce a stratum of vegetable matter. Lakes and pools of water are sometimes filled up by the accumulation of the remains of aquatic plants."* The soluble constituents of a soil, it has been stated in another part of this volume, are those most beneficial to plants. Now by means of rains, and streams which take their rise in hilly situations, the soluble matters of high-lying soils are gradually but continually being carried down into the valleys beneath; of such, by accumulation, low-lying soils are formed; they agree in their earthy constituents, with the hills in their neighbourhood, and as generally are remarkable for fertility. They are termed, by geologists, alluvial soils. It is from this continual washing and drainage, that hills of sand or chalk continue without any improvement in the staple of their surface soil.

I have stated that a knowledge of Geology is of little immediate benefit to the cultivator of the soil. It is, perhaps, needless for me to state that this is said without any participation in that spirit which would withhold improved education from all branches of the operative community. I have always maintained a contrary doctrine, and have had many opportunities to observe practical illustrations of that doctrine, which is founded upon the truth, that all knowledge is power. Neither do I mean to maintain that it would afford no light to his practical operations; but, at the same time, I would observe that it is of little importance compared with a knowledge of Chemistry and Vegetable Physiology.

GOAT.

Goat (*Capra Œgagrus*).

The flesh of the goat is not so much esteemed as that of the sheep, nor is its fleece so valuable; it has therefore obtained but little attention, and is but very little reared in any part of this island. The goat may, however, by good management be turned to some advantage, especially in rocky barren countries where no other animal could obtain support.

There are several varieties of the goat:—

1. *The Angora Goat.*—A native of Turkey, valuable for the extremely fine downy hair which grows under other hair of a coarser nature. By gently combing the goat, the down is procured from which a valuable kind of shawl, called the Cashmere, is manufactured. It is believed by some that the hair of this animal degenerates when removed from its native pasturage; but this is doubtless chiefly owing to the neglect of properly cleaning and washing it, which circumstance is particularly attended to at Angora.

* Elements of Agricultural Chemistry, p. 188.

2. *The Syrian Goat.*—A very long-eared variety, common in various parts of the east, chiefly valued for its milk.

3. *The Welsh Goat.*—These goats are remarkable for their size and strength, and are generally of a white colour. The flesh is by the natives often dried and salted in the same manner as bacon, for which it is substituted.

General Management of the Goat.

Goats are easily tamed and will eat almost any thing; feeding and browsing upon the branches of shrubs, lichens, hemlock, briars, heath, and plants of various kinds which other animals will not touch. They are generally very active, roaming, and mischievous, and will therefore require to be confined; or, if turned loose, narrowly watched, and great care taken to keep them from damaging the trees of valuable plantations. The best method is to keep them in flocks, as they are not so apt to straggle. They will require a place for shelter both in summer and winter, the variations of climate being very prejudicial to them. The usual time for coupling them is in December, they are gravid four months and a half, and bring forth from one to three young at a time, and that twice a year. Cleanliness should be particularly attended to, they require frequent washing, and their sheds must not be littered with straw, but kept perfectly clean.

Use and General Produce of the Goat.

1. *The Milk.*—This it yields generally in large quantities, and is esteemed the best milk of all animals; in some parts it is mixed with that of the cow, by which a most valuable cheese is produced. Mr. Pringle, of Kent, in his Essay on Cottage Management (*Gard. Mag.* vol. 5.) informs us that two milch goats are equivalent to one small Shetland cow.

2. *The Hair.*—This part of the goat is very valuable, and is used for a variety of purposes. Ropes made from it are said to last much longer when used in the water, than those made in the usual way.

3. *The Kid.*—The young of the goat, like that of the sheep, afford a very grateful food, and are brought to table in much the same manner as our lambs are.

4. *The Fat and Horns.*—From the fat a very superior candle is made by the inhabitants of Carnarvonshire, who kill them chiefly for that purpose. The horns make excellent handles for knives, forks, &c.

GOOSEBERRY.

Gooseberry (*Ríbes Grossulária*), Pentándria Monogy'nia, Linn; and Grossuláreæ, Juss.

The gooseberry is a native of this country, and too well known to require description. Its varieties are very numerous; the Catalogue of the Horticultural Society enumerates one hundred and eighty-five, and those of the Lancashire growers three hundred.

The following selection embraces the best:—

WHITE.

Champagne	Large Early	Royal George
Chrystal	Mountain of Snow	Snow
Early	Orleans	Walnut White
Fig		

GREEN.

Champagne	Early Hairy	Globe
Chisel	Gage	Goliah
Early	Gascoigne	Walnut

YELLOW.

Amber	Golden Ball	Honeycombe
Champagne	Golden Drop	Large
Conqueror	Hairy Amber	Upright
Golden Knap		

RED.

Admirable.	Ironmonger	New Ditto
Captain	Little Red Hairy	Small Dark Ditto
Champagne	Nutmeg	Walnut Ditto
Chrystal	Raspberry	Warrington
Early Black	Rough Red	Wilmot's Early
Early Rough		

Among these, Wilmot's Early Red deserves to hold a place in every garden. It was raised by Mr. Wilmot, market gardener, at Isleworth, in 1804, and has been cultivated by him ever since. It is the earliest gooseberry we know, being ripe in June; and for culinary purposes in May is preferable to all others. We may add to its earliness, that it is both a great bearer and high flavoured fruit. The Red Wilmot is considered best for preserving whole and drying; the Green Gascoigne is much esteemed as the highest flavoured of all the greens, and an abundant bearer. The honeycombe is the best flavoured yellow.

For the cottager's garden the following varieties are recommended, *vide* "Manual of Cottage Gardening." The bushes of all, more or less, assume conical forms, with upright shoots, consequently they occupy less space and do not shade the crop like the more straggling varieties:—

Reds.	*Whites.*	*Yellows.*	*Greens.*
Ironmonger	Beaumont's Smiling Beauty	Clayton's Venerable	Bigg's Independent
Manchester	Broadman's Transparent	Golden Drop	Early Green Hairy
Warrington	Cheshire Lass	Golden Eagle	Green Donington
	The Bright Venus.	Goldsmith	Parkinson's Laurel
		Rumbullion	Perring's Evergreen
			Wamman's Ocean

Culture, &c.

Soil.

The gooseberry will succeed in any good common garden soil, particularly if it be soft and moist, and situated on a dry bottom.

Propagated.

By cuttings, by suckers, and by seeds; the latter to obtain new varieties, the former for general cultivation. The propagation and general management of the gooseberry is in every respect similar to that of the currant, *vide* Currant, p. 157. In addition to which, the following judicious observations of Mr. Harrison's may be perused with interest:—

"Gooseberry trees like a good deep strong rich loamy soil, and almost any airy situation is suitable for them; but the crop is most abundant when the situation is favourable to their protection in spring from the cold east winds, which are frequently destructive to the blossom of those trees.

"Trees of this kind may be planted in quarters by themselves, in borders round the garden, or so as to train them against a trellis; they may be planted nearer or farther apart, according to the height of the trellis. A trellis of five feet high is what I prefer, for when it is higher it will shade the next row of trees behind, unless the trellis be fixed so as to point from south to north, but they are always best when constructed from east to west, as the trees have the full advantage of the sun. Trees planted against a trellis as described, should be set four feet apart in the rows, and six feet betwixt the rows. In planting the trees always spread the roots regularly round the bole, and at four inches from the surface; let the tree be mulched and watered immediately after being planted.

"The trees afterwards require a summer and winter regulation. In furnishing the tree with wood, let the bearing shoots be six inches apart.

"The summer regulation must be performed about the end of June or early in July, in doing which let any strong luxuriant shoots be taken away, also all suckers which may be arising. It is a practice with some persons, at this season of the year to pinch off the ends of all shoots upon the tree, but I disapprove of it as a general practice, because I have had ample proof that it causes the tree to send forth a great number of useless shoots, and thus its strength is thrown away.

"There is also another injury done to the tree at the early part of the season, by the gathering of the fruit when it is green, and before it has attained half the size it would have done. In doing this, some persons clear whole trees of the berries which were upon them, the effect of which is, that the trees being so suddenly deprived of their produce receive a very severe check, and the superabundance of sap is expended in a great production of suckers and luxuriant shoots; thus their strength is thrown away, and the trees greatly injured.

"Instead of this, we always thin off the berries from every tree, and thus the fruit which remains is improved in size, and the object of a supply of green gooseberries is obtained, whilst a proper reserve is left for ripening. If it be desired to have any large fruit, it may be obtained by a judicious thinning, shading of the fruit from hot sun, and when the fruit approaches maturity, from rain; also by watering the roots with manure water.

"The water which we use is, three quarts of drainings from a dunghill, to one quart drained from fowls or pigeon's dung, soaked for the purpose, which must be applied so as to keep the soil in a moist condition.

"Let manure water be used twice and pure water once, in regular succession.

"The winter pruning must be performed as early in the season as possible. A proper distribution of shoots must be left throughout the tree, so that the bearing shoots be six inches apart. In shortening the shoots of a good healthy tree, cut them to twelve buds, and reserve one lateral shoot as near to the origin of each main branch or shoot as possible. Cut clear away all shoots or branches not wanted, and let all suckers be pulled or grubbed up. As soon as the trees are pruned, let the mixture for the destruction of insects be applied.

"When the winter has set in, let a quantity of well-rotted manure be spread upon the soil to the extent that the roots reach to. The strength of this will be washed down into the ground and will enrich the soil, also be destructive of the larvæ of any insects which may be in the ground. At the following spring, the best rotted part of the manure may be just turned under the soil, but not to dig deeper than three inches as far as the roots extend, but the other part of the soil must be dug a spit deep. Where there is the conveniency of having well-rotted tanner's bark, I should recommend that it be occasionally used instead of manure.

INSECTS.

The Caterpillar.

Whole gooseberry trees are frequently stripped of their leaves by the ravages of this formidable insect, but their attacks may, in a great measure, be prevented by adopting the following practice, which has been successfully pursued for a number of years by Mr. Harrison.—"During the winter season," says Mr. H., "the eggs of the insect are deposited in crevices and joints of the trees, also in the ground. It is whilst they are in this state that my applications are directed. As soon as the pruning of the trees is completed, I have all the refuse shoots, &c. raked clean away and burnt; the trees are then washed over with the following mixture. A good portion of quick lime is put into a tub with some water. In three or four days afterwards this is sprinkled over the trees. When it is taken out of the tub it is well stirred up, so that a portion of the lime is taken with the water. Immediately after this has been done, a quantity of powdered quick lime is cast in among the branches. Instead of this, the trees may be washed with the following composition.—To twelve gallons of water add half a pound of tobacco and six ounces of black pepper; these must be boiled together for half an hour, and when cold be used.

"At the following spring just before the trees come into bloom, I have all the trees sprinkled over with lime water; and whilst in a weak state I have a quantity of fine powdered quick lime thrown amongst them, taking care to apply it at the under side of the foliage, and that no part of the trees is omitted. Also a little quick lime is spread over the roots of the tree, or some of the mixture as directed in the treatment of the American bug, see *Apple*, p. 17. Soon after the berries are set, I smoke the trees well by burning some moist straw near them, taking the advantage of a favourable day, so that the smoke will be conveyed to the trees. If the practice here laid down be fully attended to, it will be very rare that the trees will be attacked later in the season, provided that there are no other trees in the neighbourhood which are omitted; for, when this is the case, the flies during the summer will very probably visit the trees that have been treated as directed, and a numerous progeny will be the consequence. When this occurs, let the trees be looked over immediately after it is discovered that the insects have began their depredations, and all that can be found picked off. This is readily done, and is very effectual. If the insects increase very rapidly, let the trees be sprinkled over with lime water and powdered quick lime, as directed to be used in spring, also some lime be spread over the roots."

USE.

1. The gooseberry is very extensively employed for tarts, pies, sauces, and home-made wines. It is also held in great esteem for the dessert.

2. "Gooseberries, in the green state, can be preserved throughout the winter by several methods;—one is, to fill the bottles with water, by which means the air is excluded; and, indeed the exclusion of air is the sole object, but water is a bad medium to preserve the gooseberries in, on account of its tendency to effect decomposition. Another method is, to place the bottles filled with the berries and then corked, in water, which is gradually brought to boiling; but it would be much safer to leave the bottles uncorked, and after the boiling has been continued for a few minutes, to bung them tight, or to tie over the neck of each a strong wet bladder while the ebullition continued, there would be little danger of bursting the bottles, or of blowing off the covering, and the air would be equally expelled."—(*Gardener's Manual.*)

GRAFTING AND BUDDING.

The process of Grafting consists in the taking off a shoot from one tree, and inserting it into another in such a manner as that both may unite closely, and become one tree; the shoot or cutting thus employed is called

a SCION, and the tree on which it is inserted or grafted, a STOCK. The process of BUDDING has precisely the same object in view as that of Grafting, differing from the latter process only, in the insertion of a *Bud*, instead of a shoot or cutting, into the bark of another tree. To execute either process with adroitness and success, considerable practice is required; to excel in either, instructions should be received from some competent person, who is both able and willing to impart the necessary information. More knowledge can be acquired in a short time, in this manner, than can possibly be attained by the most attentive perusal of any treatise expressly written upon the subject. Impressed with the difficulty of the task, many writers indeed have asserted, that description alone must ever fail of conveying an adequate knowledge of the process; but, the intelligent author of the "English Gardener," with his usual ability, has treated the subject in so clear and comprehensive a manner, that he must either be a very dull or a very stupid man, who cannot comprehend the able instructions he has given; and, as we cannot hope to render the subject more intelligible, we shall give the details in our author's own language.

GRAFTING.

Before entering upon the subject of Grafting and Budding, there is one thing which is equally applicable to both processes, and that is this, that the *stock* ought to stand one whole *summer* upon the spot where it is grafted or budded, before that operation is performed upon it. If stocks be planted out in the fall, the sap does not rise vigorously enough in the Spring to afford it a fair chance for the growing of the grafts; another remark of equal importance is, that fruit trees should stand only *one summer* on the spot whence they are to be removed to their final destination; because, if they stand longer than this, they will have large and long roots, great amputations must take place, and the trees suffer exceedingly.

" *The Time of Grafting* is, generally, from the beginning of February to the end of March, beginning with the earliest sorts of trees, as plums, cherries, and pears; and ending with the latest, as apples. But seasons are different, and in a backward season, the season for grafting will be backward; and in such case, the fulness and bursting appearance of the buds of the stock, and the mildness of the weather must be our guides. However it is certain, that mild weather, with occasional showers, is the best time for grafting.

" *The mode of preparing the Scion*, comes next:—Take from the tree from which you mean to propagate, as many branches of last year's wood, as you think will cut into the quantity of scions that you want; but in choosing what branches to take, let the vigour of the tree guide you in some measure. If it be a healthy, flourishiug, and young tree, take your branches from the outside side-shoots, for the upright ones at the top, or those near the middle, are more likely to be given to produce wood than fruit. Yet do not take branches from the very lowest part of the tree, if you can avoid it, as these are sure to be more puling in their nature. In case the tree be old, or weakly, then choose the most vigorous of its last year's shoots, no matter where they grow. Keep these branches uncut till you arrive at the season of grafting, keeping them, in the meanwhile, buried in dry mould; and when that season arrives, take them up and cut them into the proper lengths for grafting. The middle part of each branch will generally be found to be the best; but your branches may be scarce, and few in number, and then make use of every part. Each scion ought to have from three to six eyes on it, but six will in all cases be quite enough, as there is no use in an extraordinary length of scion; but, on the contrary, it may be productive of much mischief, by overloading the head with young shoots and leaves as summer advances, and thereby making it more subject to accident from high winds and heavy rains.

The Operation of Grafting is performed many ways, though no one of them differs from any of the others in the *main principle*, which is that of bringing the under or inner bark of the scion, to bear upon the same bark of the stock. The sap of the stock flows upwards towards the scion, and it will flow on into the scion, provided it find no interruption. Here, therefore, is the nicety: to fit those two barks so closely the one upon the other, that the sap shall proceed onward into the scion, just as it would have done into the amputated branch, causing the scion to supplant the branch. I shall only mention and illustrate two modes of grafting, namely, *tongue-grafting* and *cleft-grafting*. These two it is necessary for me to speak of separately, and thoroughly to describe, for they are not both of them applicable in all cases, the former being used for grafting on small sized stocks, and small branches of trees, and the latter on large stocks, and large branches.

Tongue Grafting.—Suppose you, to have your stock of the proper age for grafting, you cut it off three or four inches from the ground, and with a very *sharp, straight and narrow-bladed*

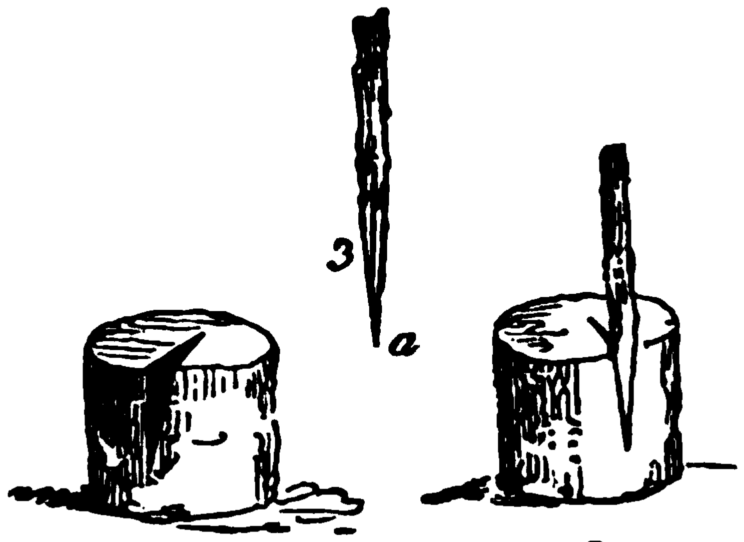
grafting knife, cut a thin strip of wood and bark upwards, from about two inches below the top of your already-shortened stock. Make this cut at one pull of the knife, inserting the edge rather horizontally, and when it has gone through the bark and into the wood, a little short of the middle, pull straight upwards, (fig. 1 *a b*)

1 2 3 4 5

then, at rather less than half-way down this cut, and with the blade of your knife across the cut, and downward, cut a very *thin tongue* of not more than three eights of an inch long (fig 1 *c*). Proceed nearly in the same way with the bottom part of the scion, cut first a narrow strip of wood and bark out, but not putting the knife in horizontally, as you have done with regard to the stock, at fig. 1 *a*, not bringing it out straight to the end, to make a shoulder or angle, as you have done at fig. 1 *b*; but make a sloping cut (fig 2 *a b*) of about the same length as the cut in the stock, or a little less if anything; then make a tongue (fig. 2 *c*) to correspond with that in the stock, but recollect this must be cut *upward* instead of *downward*; then place the scion upon the stock, inserting the tongue of the scion into the tongue of the stock. Bring the four edges of bark, that is, the two edges of the cut in the top of the stock, and the two corresponding edges of the cut in the bottom of the scion, to meet precisely; or, if the scion be, in diameter, a smaller piece of wood than the stock, so that its two edges of bark cannot both meet those of the stock, then let only one meet, but be sure that that one meets precisely. But observe well, that this can never be unless the first cut in the stock, and that in the scion, (figs 1 *a b* & 2 *a b*), be as even as a die, and performed with a knife scarcely less sharp than a razor. Take a common pruning knife, and attempt to make a cut of this kind, and you will find, when you come to fit the scion on, that, squeeze them together as you may, you will, in most cases, see light between the parts of the stock and the scion that you are trying to join, so effectually, as that the sap shall flow out of the one and into the other, unconscious of any division at all! But I will not suppose any body so ungain (as it is called in Hampshire) as to go about so nice an operation as this, without being prepared with the proper instrument for performing it; and, therefore, I now suppose the scion put on properly, and presenting the appearance as in fig. 3. But this is not all; the operation is not yet complete. The two parts thus joined must be bound closely to one another by matting, or bass as the gardeners call it, (fig. 4). A single piece tied on to the stock, an inch or so below the part grafted, and then wound closely up, till it reach the very top of the stock, will, if well done, almost insure the junction; but, lest parching winds should come and knit up all vegetation, it is usual to put on, besides the bandage of matting, a ball of well-beaten clay, sprinkled over with a little wood-ashes, or the fine siftings of cinders, to cover completely the parts grafted, that is, from an inch below them to an inch or so above them, (fig 5), and even to prevent this ball of clay, from being washed off by heavy rains, it is well to tie round it, a covering of coarse canvass, or else to earth up the whole plant as you do pease or beans, drawing a little mound round it so as nearly to reach the top of the clay. Something now remains to be said on the *future treatment* of the grafted plant. In a month's time, at least, you will see whether the scion have taken, it will then be either bursting forth into leaf, or it will be irrecoverably dead. In this latter case, take off immediately the canvass, clay, bandage, and dead scion, and let the stock push forth what shoots it please, and recover itself. In the former case, however, you must as soon as the scion is putting forth shoots, cut off or rub off all shoots proceeding from the stock between the ground and the clay, as these, if suffered to push on, would divert the sap away from the scion, and probably starve it, then carefully stake the plant, that is, put a small stick into the ground, at within three inches or thereabouts of the root, and long enough to reach a few inches above the scion, which you will tie to it slightly with a piece of wetted matting. This is really necessary, for when

the shoots proceeding from the scion become half a foot long, they, with the aid of the leaves, become so heavy that when blown to and fro by the wind, will break off immediately above the clay, or become loosened down at the part joined to the stock. The staking being done, you need do nothing more till about the end of June, when you should take off the whole mass of canvass, clay, and bandage, but be very careful in taking off the clay not to break off the plant at the junction. It should be done by a careful hand, and after a day or two of rainy weather, as then the clay is moist and comes off without so much danger to the plant as when it is not. On taking off the clay, there is found a little sharp angle, left at the top of the stock; this should now be cut smooth off. The back of the stock, and that of the scion will heal over this, and the union is then complete. Lastly, it is frequently found that mould, and sometimes small vermin have collected round the heretofore covered parts of the plant, according as the clay has been cracked by the sun. Rub off all mould with your fingers, (no instrument does it so well) and kill all the vermin the same way, and it is not amiss to finish this work by washing the joined parts with a little soap and water, using a small painting brush for the operation. All these things done, you have now only to guard against high winds, which if the plants be not staked as is above described, will very likely be broken off by them; and, in this work of destruction you will have the mortification to see the finest of your plants go first.

Cleft Grafting.—This is a species of grafting adopted in cases where the stock is large, or where it consists of a branch or branches of a tree headed down. In either of these cases saw off horizontally the part you wish to graft, and smooth the wound over with a carpenter's plane, or a sharp long bladed knife, (fig. 1).



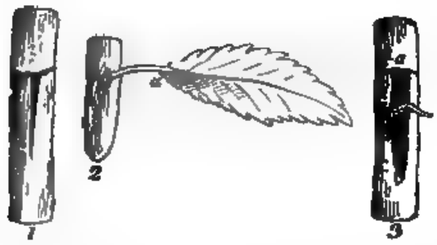
Prepare your scion in this manner:—At about an inch and a half from the bottom, cut it in the form of the blade of a razor; that is, make it sharp on one side, and let it be blunt at the back, where you will also take care to leave the bark whole, (fig. 3*a*). Having thus prepared the scion, make a split (fig. 1) in the crown of the saw cut downwards for about two inches, taking care that the two sides of this split be perfectly even. Hold it then open by means of a chisel or a wedge, (or when the stock is but a small one, your knife, and insert the scion, the sharp edge going inwards, and the bark side, or razor back, remaining outward, so that on taking out the wedge or chisel, the cleft closes firmly upon the scion, (fig. 3), the two edges of bark formed by the cleft, squeezing exactly upon the two edges of bark formed by the blunt razor back. To make the two barks meet precisely, is the only nicety in this operation; but this is so essential, that the slightest deviation will defeat the purpose. In this sort of grafting, the stock on which you graft is generally strong enough to hold the scion sufficiently close between its cleft, without the aid of binding, and then it is better not to bind; but as it is also necessary to prevent air circulating within the wounded parts both of the stock and scion, use grafting-clay to cover them over so as effectually to exclude that air, and cover the clay with a piece of coarse canvass, wetting it first, and then binding it on securely. In this way, the stock being strong, you may insert several scions on the same head, by making several different clefts, and putting one scion in each; but this can only be to insure your having two to succeed, for if all the scions that you put upon one head take, you must choose the two most eligible, and sacrifice the rest, as more than two leading limbs from such head ought not to be encouraged. The season for performing this sort of grafting, and the mode of preparing the scion, and the future treatment of the tree, are precisely the same as in *tongue grafting*.

I have mentioned an application of clay to be used in grafting; but it may be as well here to give some particular instructions as to preparing it, before I end this article on Grafting. The object being to put something round the wounded parts of the stock and the scion, that shall exclude water and air, it is necessary of course that the application be adhesive and close. Pure yellow or blue clay is both; beat it well with a good stout stick, now and then pouring on a little water to make it work; get it in this way to be perfectly pliable

in the hand, beat it upon a hard stone or a boarded floor, or a brick floor swept clean first; but beat it again and again, returning to it for two or three days, and taking a spell each day. If you suffer it to remain hard, besides the danger of unsettling the scion, in squeezing round it this untractable mass; it cracks the very first hot day, and is utterly useless. Let it therefore be so loose that the man who follows the grafter to put it on, can take off a piece and readily flatten it out into a kind of pancake, an inch or so thick, and wrap it, without any exertion on his part, or any resistance on the part of the plant, round the grafted tree. Then he should sprinkle a little wood ashes over the whole to dry it, and take off the immediate effect of the sun.

BUDDING.

Budding is performed for precisely the same purpose as Grafting, and, like Grafting, it is performed in many different ways; but I shall only notice the most usual: and as long as experience has ascertained the best method, namely, that of T budding, so called from the form of the two cuts that are made in the bark of the stock to receive the bud (fig. 1); or *shield budding*, as it is sometimes called, from the form of the piece of bark on which the bud is seated (fig 2) assuming the shape of a shield when it is prepared to be inserted within the T cut in the stock. The only solid difference between Budding and Grafting is this,



that whereas in Grafting you insert on the stock *a branch* already produced: in Budding you insert only the *bud*. I shall proceed, in treating of this matter, in the same way that I did in the preceding article; namely, as to the *season proper for budding, the choosing and preparing of the bud, the operation of budding, and the future treatment of the plant budded.*

The Season for Budding is generally from the latter end of July to the latter end of August, the criterions being a plump appearance of the bud formed on the spring shoot of the same year, seated in the angle of a leaf; and a readiness in the bark of the stock to separate from the wood.

In *choosing and preparing the bud*, fix on one seated at about the middle of a healthy shoot of the midsummer growth. These are, generally speaking, most inclined to fruitfulness. Choose a cloudy day, if you have a choice of days at this season; and if not, perform your work early in the morning, or in the evening. The time being proper, you sever the branch on which you find buds to your liking. Take this with you to the stock you are going to bud: holding the branch in your left hand, the largest end downward, make a sloping cut from about an inch and a half below the bud, to about an inch above it, suffering your knife to go through the bark, and about half way into the wood, cutting out wood and all. This keeping of the wood prevents the bud and its bark from drying while you are preparing the incision in the stock: and if you wish to carry buds of scarce sorts to any distance, you may do so safely by putting their ends in water, or in damp moss, but it is always safer, as well in grafting as in budding, to perform the operation with as much expedition as possible, but particularly it is so in budding.

Operation of Budding.—Cut off the leaf under which the bud is situated, but leave its footstalk, (fig. 2 a) and by this hold it between your lips, while with your budding knife you cut two straight lines in the stock at the place where you wish to insert the bud, and this should be at a place where the bark is smooth, free from any bruises or knots, and on the side rather from the mid-day sun. Of these lines let the first be horizontal, (fig. 1) and let the next be longitudinal, beginning at the middle of the first cut, and coming downward. Let them, in short, describe the two principal bars of the Roman letter T. You have now to take out from the bark on which the bud is, the piece of wood on which the bark is, and which has served you up to this time, to preserve the bark and bud from drying and shrinking. But this is a nice matter. In doing it, you must be careful not to endanger the root as it is called, of the bud, because in that is its existence. The bark, (if the season be proper for budding) will easily detach itself from this piece of wood, but still it requires very careful handling to get it out without endangering the *root of the bud*. Hold the bud upon your forefinger, and keep your thumb on the wood opposite: then, with the forefinger and thumb of the other

hand, bend backward and forward the lower end of the shield, and thus coax the wood to disengage itself from the bark; and when you find it decidedly doing so, remove your thumb from it, and the whole piece of wood will come out, leaving you nothing but a piece of bark of about two and a half inches long, with a bud and a foot stalk of a leaf on it. If the root of the bud be carried away with the piece of wood, you will perceive a small cavity where it ought to be. In this case throw away the bud and try another.

Having succeeded in the second attempt, now open the two sides of the longitudinal car of the T, with the ivory haft of your budding knife, but in doing this raise the bark clearly down to the wood, for the inside of the piece of bark belonging to the bud must be placed directly against this. Having opened these sides wide enough to receive the longest end of the bark, insert it nicely, taking especial care that its inner side lie flatly against the wood of the stock. Then cut the upper end of the bark off, so that its edge shall meet precisely the edge of the horizontal bar of the T. (fig 3 *a*) With your finger and thumb, bring the two sides of the longitudinal bar over the bark of the bud, or rather the shield, and with a piece of well soaked matting, begin an inch below this bar, and bind firmly all the way up to an inch above the horizontal bar, taking good care to leave the bud peeping out. Bind in such a way as to exclude the air, for that is the intent of binding in this case. Tie your piece of matting on first, and then wind it round and round the stock as you would a ribbon, taking care not to twist the matting, wind it *slowly*, and every time you have gone completely round, give a gentle pull to make it firm.

Future treatment.—In a fortnight's time from the operation, you will discover whether the bud has taken by its roundness and healthy look; and in a fortnight after that, loosen the bandage to allow the whole plant to swell, and in about five weeks from the time of budding take away the bandage altogether. In this state the plant passes the winter, and just as the sap begins to be in motion in the following spring, you head down the stock at about half an inch above the bud, beginning behind it, and making a sloping cut upward to the end above its point. Some gardeners leave a piece of the stock above six inches long for the first year, in order to tie the first summer's shoot to it, to prevent its being broken off by the wind. This may be well when the plant is exposed to high winds, but even then, if you can see danger, you may tie a short stick on the top part of the stock, and to this tie the young shoot, and then the sap all goes into the shoot from the bud, instead of being divided between it and the six inches of stock left in the other way.

There are some advantages that *budding* has over *grafting*, and these I think right to mention. In the first place, universal experience has proved that certain trees succeed very much better when budded than the same trees do when grafted; such are the peach, nectarine, apricot, plum, and cherry; indeed, the rule is, that all stone fruits do better budded than grafted,—that they are when budded less given to gum, a disease peculiar to stone fruits, and often very pernicious to them. You may also by budding put two or more branches upon a stock that would be too weak to take so many grafts, and you may bud in July when grafting has failed in March and April. The disadvantages of budding are that the trees are rendered one year later in coming into bearing than when you graft."

Mr Knight has recommended a mode of budding, (*Hort. Trans.* vol. 1.) He thus describes the process:—" In the month of June as the luxuriant shoots of my peach tree were grown sufficiently firm to permit the operation, I inserted buds of other varieties into them, employing two distinct ligatures to bind the buds in the places. One ligature was first placed above the bud inserted, and upon the transverse section through the bark; the other, which had no farther office than that of securing the bud, was applied in the usual way. As soon as the buds had attached themselves, the ligatures last applied were taken off, but the others were suffered to remain. The passage of the sap upwards was in consequence much obstructed, and the inserted bud began to vegetate strongly in July, and when these had afforded shoots about four inches long, the remaining ligatures were taken off to admit the excess of sap to pass on, and the young shoots were nailed to the wall; being there properly exposed to light, their wood ripened well, and afforded blossoms in the succeeding spring."

ON THE CULTIVATION OF THE NATURAL GRASSES.

BY GEORGE SINCLAIR, F.L.S. F.H.S.

Grass, Grasses, *Gramina.*

In husbandry the term grass is generally applied to all herbaceous plants with long narrow leaves, and to denote the herbage of pastures and meadows. The proper grasses, however, constitute a natural order or family of plants, and of all others are perhaps of the greatest importance and value to man. The annual species of grasses supply the staff of life, bread; and the perennial, afford an equivalent to that for the sustenance

and perfection of the more valuable domestic animals, in the produce of the richest natural pastures and hay meadows; in a word, this tribe of plants constitute the foundation of the riches of a farm, as that does the foundation of the riches of a country.

The botanical characters by which a proper species of grass is distinguished from all other plants, are simple and easily understood; they are as follow:—

The stem or straw is hollow and jointed; the leaves are long, slender, and entire, or, without serratures on the margin, sheathing the stem for some length, and in number equal to the joints of the straw, culm, or stem; the flower, which through its whole structure is simple and elegant, consists of one or two membranaceous husks, as the calyx, Fig. 1; the corolla, 4; the feathered stigma with the germen or rudiment of the seed, 3; the stamens and anthers or male parts of the flower, 2. Each flower bears but one seed, and the seed in vegetating produces but one seed-leaf. Every plant therefore that possesses all these peculiarities of structure, is a proper species of grass, and hence the proper grasses are called a natural order of plants.

But, besides this agreement of external structure, grasses are distinguished from other natural orders of plants by this property, that every part of the plant becomes an acceptable food for the larger and more valuable domestic animals; other natural orders of plants afford certain parts only, as perhaps the seed, fruit, roots, or leaves.

It was long supposed by practical farmers, that the herbage of meadows and permanent pastures consisted of only two sorts of grass, namely, natural grass, and clover-grass. Botanists* first pointed out the number of distinct species of grasses which are to be found in natural pastures; but the proportions in which the different species are combined by nature in the constitution of the richest meadows as well as in natural pastures on different soils generally, the comparative merits and value of each species and of combinations or mixtures of these, their habits of growth and the best modes of culture, are all of late years discovery†. There are upwards of one hundred and thirty distinct species of grasses, besides numerous varieties of these, native of Great Britain; and there is no variety of soil intermediate between the Alpine rock or Arid blowing sand to water itself, but is provided by the bountiful hand of nature with grasses peculiarly adapted to grow and remain permanent on each particular soil and site. Besides the grasses indigenous to the climate and soil of Britain now mentioned, there are upwards of one thousand species natives of other climates, many of which are capable of being cultivated with advantage in this. Notwithstanding the great similarity of appearance which the individual species of this numerous tribe of plants present to the general observer, particularly when in a state of sward or cropped turf, or when the state of inflorescence is indistinct, not two species will be found to agree in the following important points: the time or period of the season when the plant or herbage is in the greatest perfection and vigour of growth; the quantity and properties of the nutritive matter

* Linnæus, Stillingfleet, Curtis, Sir Ja. E. Smith, and many others.

† See *Hortus Gramineus Woburnensis*: or an Account of the Results of Experiments on Grasses and other Plants, used as the food of the more valuable Domestic Animals. Instituted by John Duke of Bedford. Published by Ridgway, London, 1826, 3rd Edition.

afforded from the spring herbage, the culms when in flower, when the seed is ripe, and from the autumn or aftermath herbage; the property of reproduction, or, the degree of rapid or slow growth after being cropped by the scythe, or by depasturing; the degree of luxuriance of the leaves or herbage at the period the culms are in flower and when the seed is ripe; the nature of the soil which each most affects; and the degree of power which each species possesses of withstanding the effects of long-continued drought, or of long-continued rains. These diversities of habits and properties, or different degrees of the like properties and habits of growth in the individual species of grasses, constitute a most important guide in the formation of a meadow or permanent pasture of the best quality for early spring produce, superior weight of crop, nutritive powers, and a constant supply of new herbage throughout the season under every circumstance of unfavourable extremes of weather. But we shall have occasion again to refer to this point. There is another important law in the natural economy of the grasses which governs all those species of most value to the farmer, it is this, that individual plants of the same species will not grow close to each other for any length of time, for however thickly planted from seed, in one or two seasons intermediate plants decay and leave vacant spaces, which are soon filled up with spurious grasses, weeds, or moss; but when a variety of different species, adapted to the soil, are mixed intimately together they grow close, form a dense bottom, and continue permanent.

The exceptions to the above law in the natural economy of the grasses are but few. The Early Hair Grass, *Aira præcox*, on elevated dry sands, where the plant seldom exceeds an inch in height; the Sheep's Fescue grass, *Festuca ovina;* Viviparous Fescue, *Festuca vivipara;* Alpine meadow grass, *Poa alpina;* Upright Matt-grass, *Nardus stricta;* and Blue Melic grass, *Melica cærulea;* on heaths and Alpine situations, are in general found growing in separate tufts or solitary. The Flote Sugar grass, *Glycerea fluitans;* Water Hair grass, *Aira aquatica;* and Water Meadow grass, *Poa aquatica;* in water. The Sand Lime grass, *Elymus arenarius;* Sand Reed grass, *Arundo arenaria;* and Creeping Fescue, *Festuca rubra;* which arrest the progress of the sea in making inroads on the land, occupy distinct spaces of the blowing sands of the coast. These constitute almost the only exceptions to the important law above alluded to.

It has long been a prevailing opinion among practical farmers, that when the valuable sward of a rich natural pasture is once broken up, and a course of tillage crops taken from the soil, the valuable sward cannot be again renewed, or, at least not until the lapse of many years. The results of practice, in every instance, prove the truth of this opinion, that with rye grass and clovers, or with these and what are termed hay seeds*, a permanent pasture of the best quality as to early growth in the spring, summer, autumn, and winter produce and nutritive properties, cannot be made. An attentive perusal of the laws above-mentioned which govern the growth of the superior meadow grasses, will have already almost pointed out the cause of the failures in all attempts to form a permanent

* Hay seeds consist of the sweepings of hay-lofts, or the seeds and chaff obtained from hay. Although the hay from whence these seeds are obtained may be of the best quality, or from a rich permanent pasture, yet it is found that seldom more than the seeds of two or three species are perfect in the mass, the rest of it being chaff of seeds already shed, or the abortive husks of unripened grasses with whatever weeds or spurious grasses the hay may be mixed. The superior grasses perfect their seeds at different seasons. Some early in spring and others in succession until autumn.

meadow with rye grass, clovers, and hay seeds, equal to that formed by nature; but the question will be put beyond a doubt by shewing what kinds of grasses constitute in reality the produce of the richest natural pastures, and by comparing the natural habits of growth, comparative weight of produce and nutritive properties of these, with the like properties in rye grass and clovers.

The different grasses, and other plants which compose the produce of the richest natural pastures, are in number about twenty-six, more or less. From spring until the end of autumn there is not a month but what constitutes the particular season of superior luxuriance, or height of growth of one or more of these grasses; hence proceeds the constant supply of rich succulent herbage throughout the whole of the season, a circumstance, or an essential valuable property in a pasture, which is wanting in those artificially formed of rye grass and clover. If the most fattening natural pastures be examined at different seasons of the year, the produce will be found to consist of the following plants, but differing in the proportions in which they are combined according to the local nature of soils.

Meadow Foxtail, *Alopecurus pratensis*
Sweet-scented vernal grass, *Anthoxanthum odoratum*
Meadow fescue, *Festuca pratensis*
Cock's-foot grass, *Dactylis glomerata*
Meadow cat's-tail, *Phleum pratense var. major.*
Tall oat-like soft-grass, *Holcus avenaceus*
Creeping vetch, *Vicia sepium*
Rye grass, *Lolium perenne varietas*
Field brome grass, *Bromus arvensis*
Annual meadow or Suffolk grass, *Poa annua*
Meadow oat-grass, *Avena pratensis*

—which afford the principal grass in spring, and also a great proportion of the summer produce—

Yellow oat-grass, *Avena flavescens*
Meadow barley-grass, *Hordeum pratense*
Crested dog's-tail grass, *Cynosurus cristatus*
Hard fescue grass, *Festuca duriuscula*
Rough-stalked meadow grass, *Poa trivialis*
Smooth-stalked meadow grass, *Poa pratensis*
Woolly soft grass, or Yorkshire fog, Yorkshire whites, &c, *Holcus lanatus*, sparingly
Perennial red clover, *Trifolium pratense perenne*
White or Dutch clover, *Trifolium repens*
Yellow vetch, or meadow vetchling, *Lathyrus pratensis*
Smooth fescue, *Festuca glabra*

—which yield produce principally in summer—

Yarrow, *Achillea millefolium*
Creeping bent, or fiorin, *Agrostis stolonifera, var. latifolia*
March bent grass, *Agrostis palustris*
Creeping wheat grass, or couch grass, *Triticum repens*

—which vegetate with most vigour in autumn.

Besides these, there are other plants which we have invariably found in natural pastures, as Butter-cups, *Ranunculus acris*; Rib grass, *Plantago lanceolata*; Sorrel dock, *Rumex acetosa*. But of these the rib grass and butter-cups were by far the most common, the sorrel dock being confined to particular spots, or particular varieties of soil. We may here observe, that during the course of many years' practice in examining the produce of pastures, on all varieties of soil, and the effects of different modes of depasturing and culture, we could never observe the smallest indication of stock (horses, cows, and sheep) having touched the *Rumex Acetosa*, or *Ranunclus acris*, excep

from the apparent necessity caused by overstocking, or where these plants were too numerous in the pasture to be wholly avoided by the mouths of the animals.

It was observed above, that the proportions in which the various distinct species of proper grasses and plants now enumerated are found combined in pastures, varies according to the nature of the soil. In siliceous sandy soils the *Festuca duriuscula*, *Festuca glabra*, *Agrostis vulgaris*, *Holcus mollis*, *Agrostis fascicularis*, *Cynosurus cristatus*, *Poa pratensis*, *Holcus lanatus*, are in a larger proportion, and the *Festuca pratensis*, *Dactylis glomerata*, *Lolium perenne*, *Phleum pratense*, *and Alopecurus pratensis*, in the smallest, if not altogether wanting, under certain circumstances. When the texture of a soil is of a medium quality as to moisture and dryness, and contains calcareous matter or chalk, as well as siliceous earth or sand, the *Alopecurus pratensis*, *Festuca pratensis*, *Dactylis glomerata*, *Phleum pratense major*, *Holcus avenaceus*, *Poa trivialis*, *Anthoxanthum odoratum*, and *Lolium perenne*, will be found to constitute the larger proportions, and the other grasses enumerated, the smaller. When the soil is peaty, but free of stagnant moisture by proper draining, and the peat of that description called *active* peat moss*, the *Anthoxanthum odoratum*, *Dactylis glomerata*, *Festuca pratensis*, *Poa trivialis*, *Alopecurus pratensis*, *Cynosurus cristatus*, *Agrostis stolonifera*, *var. latifolia*, *and Holcus avenaceus*, will be found to predominate. In calcareous soils, the *Dactylis glomerata*, *Festuca pratensis*, *Cynosurus cristatus*, *Festuca duriuscula*, *Lolium perenne*, *var.* and *Bromus erectus*, are most prevalent, while the *Alopecurus pratensis*, *Phleum pratense major*, *Agrostis stolonifera latifolia*, and *Poa trivialis*, are in a small proportion; but we shall state a few examples from the pastures most celebrated for fattening and for dairy produce, in Devonshire, Lincolnshire, and in the vale of Aylesbury, from practical examination on the spot, as well as from turfs of the respective pastures, placed side by side on their respective soils, or on soils and subsoils of a similar nature to those of the fields or meadows in question, from which the turfs were taken.

1. *A rich ancient pasture* at Hurdwick, in Devonshire, belonging to the Duke of Bedford, contained in every square foot, by careful estimate—*Anthoxanthum odoratum*, *Cynosurus cristatus*, *Lolium perenne*, *var. Russelianum*, *Poa pratensis*, *Poa trivialis*, *Dactylis glomerata*, *Holcus lanatus*, *Festuca pratensis*, *Achillea millefolium*, *Trifolium repens*, *Trifolium pratense perenne*: besides these there were in smaller proportions, *Rumex acetosa*, *Plantago lanceolata*, *Hieracium pilosella*, *Prunella vulgaris*.

2. *A rich natural pasture* at Endsleigh, in the same county, belonging to the Duke of Bedford, which on an average fattened a bullock of one hundred and sixty stone, (Smithfield weight), and wintered two sheep per season per acre—*Festuca pratensis*, *Festuca duriuscula*, *Alopecurus pratensis*, *Dactylis glomerata*, *Bromus mollis*, *Poa trivialis*, *Cynosurus cristatus*, *Festuca rubra*, *Agrostis stolonifera latifolia*, *Lolium perenne Russellianum*, *Lolium perenne var. Compositum*, *Trifolium pratense perenne*, *Trifolium repens*, *Achillea millefolium*, *Rumex acetosa*, *Anthoxanthum odoratum*, with a small portion of *Bellis perennis* and *Stellaria graminea*.

To those who are accustomed to consider as necessary one or two species of grass only, as rye-grass and clover, the fact of twenty-two dif-

* See *Hortus Gramineus Woburnensis*, 3rd Edition, p. 123.

ferent species of grasses and other plants being produced on something less than the space of a square foot of the best fattening pastures, would scarcely appear credible unless it was thus demonstrated. The soil, we found to consist of

	Grains.
Water of absorption	55
Fine sand, partly siliceous and partly aluminous	148
Decomposing vegetable matter	38
Oxide of iron	40
Carbonate of lime or chalk	0
Soluble vegetable and saline matter	6
Alumina, or pure matter of clay	34
Silex, or pure earth of flints in an impalpable state	60
Loss in the collecting of the products, and loss by moisture	19
	400

The most remarkable point in the constitution of this soil, is the total want of lime or chalk, and the large quantity of oxide of iron. In a drier climate than that of Devonshire, a soil of this nature would be much less fertile, and applications of lime would be essential.

3. *A rich ancient pasture* near Croft Church, Lincolnshire, the soil of which consisted of

	Grains.
Water of absorption	60
Fine sand, partly calcareous and partly siliceous	160
Decomposing vegetable matter	40
Oxide of Iron	8
Carbonate of Lime or chalk	32
Soluble vegetable and saline matters	6
Alumina, or pure matter of clay	25
Silex, or impalpable earth of flints	65
Loss of products in the analysis	4
	400

In this soil the proportion of calcareous matter, or lime, is considerable; the oxide of iron is in a moderate quantity; and the proportion of clay to that of siliceous earth is small. The pasture on this soil fattened through the summer one large ox, and from three to four sheep per acre. The produce or herbage was composed of—*Alopecurus pratensis*, *Dactylis glomerata*, *Festuca pratensis*, *Festuca duriuscula*, *Cynosurus cristatus*, *Phleum pratense major*, *Poa trivialis*, and *Lolium perenne*, in the larger proportion, with a smaller admixture of *Avena flavescens*, *Holcus avenaceus*, *Agrostis Stolonifera latifolia*, *Hordeum pratense*, *Vicia sepium*, *Anthoxanthum odoratum*, *Achillea millefolium*, *Trifolium repens*, *Trifolium pratense perenne*, *Agrostis palustris*, *Holcus lanatus*, *Poa pratensis*, in all twenty distinct species. A turf one foot square of this pasture, on having the earth carefully washed from the roots of the herbage, and the individual plants of which it consisted separated, their number amounted to one thousand and ninety. It will not excite surprise, therefore, that so great a variety of different species of grasses should be found combined in the space of one square foot of ground, and, that several, as the first eight mentioned species, should be in a greater proportion, as to number, than the others.

4. *Down pastures*, comprehend dry elevated situations, sandy or heath soils, and chalk lands under a genial local climate, and on which the following grasses, more or less, constitute the principal herbage: *Festuca*

ovina, *Festuca duriuscula*, *Festuca dumetorum*, *Festuca glauca*, *Agrostis canina*, *Agrostis vulgaris*, *Avena pubescens*, *Aira flexuosa*, *Alopecurus alpinus*, *Poa pratensis*, *Poa compressa*, *Bromus mollis*, *Holcus mollis*, with more or less of *Dactylis glomerata*, *Lolium perenne*, *Cynosurus cristatus*, *Avena flavescens*, *Phleum pratense minor* and *Bromus erectus*, of the proper grasses. The clovers are chiefly the *Trifolium repens*, *Trifolium pratense perenne*, *Medicago lupulina*, *Lotus corniculatus* and *Hedysarum onobrychis* or *Saintfoin*. The Wild Thyme, *Thymus serphyllum ;* Wild Flax, *Linum Catharticum*, *Scabiosa columbaria*, *Ornithopus purpucellus*, *Juncus campestris*, and some other plants occur locally, but they are found in too small a proportion to render them worthy of farther notice here, particularly as they seem never to be eaten by sheep unless when the scarcity of food compels the stock to depasture very closely.

5. *Irrigated pasture* or best water meadow. When a water meadow is constructed in the best manner, all the superior nutritive and productive grasses flourish in a surprising degree, we may therefore refer to the grasses mentioned in the first list instead of repeating the names.

The number of individual plants on a given space of soil, was before referred to, when speaking of the composition of rich ancient permanent pasture. The number occupying the surface of one square foot was stated to be 1090 plants, consisting of twenty distinct species ; but under irrigation the number of individual plants on a given surface is found to exceed that, being on an average 1798 individual plants to every square foot of ground.

6. *Pastures formed of rye-grass and clover* on a soil of the best quality, or of the same nature as the natural pasture, No. 1, afforded seventy-five plants only to the square foot of surface, and on an average calculation could not maintain but a small proportion of the stock fattened by the pasture above alluded to and compared with it; the comparative quantity of plants being as 75 to 1000.

Having now shewn the nature or composition of the herbage of natural meadows, and of artificially formed pastures in the aggregate or number of distinct species of grasses combined in each, it is next of importance to ascertain the properties and comparative value of each distinct species in order that the proportions in which they should be combined, so as to produce the most valuable pasture, may be determined. To effect this essential point it is absolutely necessary that each distinct species should be cultivated by itself or separately as well as in combination with others, on soils of the like nature and also on different soils. The properties which give value to a grass are 1st. Early growth. 2nd. Superior weight of produce. 3rd. Permanency. 4th. Reproductive powers. 5th. Late growth ; and 6th. Nutritive powers. To ascertain the exact degree in which these properties exist in all the different grasses, is essential before a pasture can be made with seeds to resemble or equal in value those of the richest natural pastures, for some of the species above-mentioned may be found so inferior to others as to render it proper to exclude them altogether, and others so superior as to point out the advantages of having these in a larger proportion in the mixture, according to the nature of the soil ; thus a pasture, even superior to that formed by nature in the course of ages, may, by a skilful application of the principles of culture now recommended, be obtained in two seasons. The time, labour, and expence of cultivating all these different species of grasses separately and in

combination, so as to ascertain their comparative value and natural habits, would be found very considerable, inasmuch as single trials, or one or two years space of time, would be found inadequate to ascertain these essential points, but many years culture and that varied in such a manner that the results of the trials in each case would on a repetition be always found the same. Fortunately the natural habits and comparative value of these grasses have already been determined in the most satisfactory manner, by a long continued and extensive series of experiments instituted by John Duke of Bedford for that purpose expressly. From the published account of the results of these experiments, "Hortus Gramineus Woburnensis," we will here give a summary of the natural habits and comparative value of the principal species of the essential grasses:—

Fig. 1.

Anthoxanthum Odoratum, or Sweet-scented Vernal Grass.

Botanical or specific character of distinction.—*Panicle* spiked, ovate oblong, flowers longer than their awns, on short partial stalks.—See *Hortus. Gram. Wob.* p. 134.

The blossom of this grass is double, the outer one is entirely different from that of any other of the grasses, its outside is covered nearly to the top with stiff brown hairs, lying flat. *Stem* with two or three short hairs, and shining joints. Native of Britain

Dissections.—1. Calyx or husks; 2. Stamens and anthers, or male parts of the flowers and corolla, with the awn and feathered stigma; 3. Feathered stigma on the germ of the seed; 4. Corolla husks, the natural size.

On a brown sandy loam the produce of this grass in the beginning of April, is—

	Per Acre. *lbs.*
Green food, or grass	3403
Nutritive matter	95
At the season of flowering, the produce of grass is	1897
When made into hay the produce weighs	2105
At the time the seed is ripe the produce is— green food	6125
Or when made into hay weighs	1837
The weight of nutritive matter afforded by this crop is	311

The weight of nutritive matter which is lost, therefore, by taking the crop when the grass is in flower, exceeds one half of its value, or 188 lbs. per acre.

The proportional value which the grass at the time the seed is ripe, bears to that of the time of flowering, is as 13 to 4.

The proportional value which the grass of the lattermath bears to that of the seed crop, is nearly as 13 to 9; and the proportional value or nourishment contained in the autumn grass, exceeds that of the first grass of the spring, as 9 to 7

The nutritive matter of this grass, consists of the following vegetable principles in every 100 parts of the soluble extract: viz—

Mucilage or starch	86
Sugar, or saccharine matter	8
Bitter extractive, or tonic matter	6
	100

The first growth of the herbage in Spring affords—

Mucilage, or starch	80
Sugar	2
Tonic, or bitter extractive matter	18
	100

The tonic, or bitter extractive matter, is here in a larger proportion than in the summer produce, or in that containing the flowering or seed culms, and the quantity of sugar is less. This grass gives the new-mown hay that delightful smell which is peculiar to it. It constitutes a portion of the herbage on pastures, on almost every kind of soil, although it attains to perfection on those only that are deep and moist. It thrives best, and is most productive and permanent when combined with other species of grasses, and it is therefore a true permanent pasture grass. When sown by itself, the sweet-scented vernal is not a profitable grass. Mr. Grant, of Leighton, laid down a field of considerable extent with this grass,

and another adjoining field with the meadow foxtail, *Alopecurus pratensis.* A portion of clover seed was sown in each case: white clover with the former, and red clover with the latter grass. Both fields were open at the same time to sheep. The stock gave a decided preference to the meadow foxtail. We saw this trial conducted on a large scale, and with every impartiality, by Mr. Grant, and the conclusions agreed with the results of our own trials,—that the sweet-scented vernal is a useful ingredient in pastures on a deep moist soil, but is unfit to be cultivated by itself.

The superior quantity of nutritive matter contained in the crop at the season of the seed being ripe, instead of at the time of flowering, (generally supposed to be the period when grasses contain the most nourishment) is so far a wise provision of bountiful providence, inasmuch that from the circumstance of this grass flowering in April and May, its crop could not be taken at that period without sacrificing the greater number of different grasses not then in a state of inflorescence ; as it is, when the seed of the sweet-scented vernal is ripe, the greater number of the superior pasture grasses, are in various stages of inflorescence. The season of coming into flower, is generally about the middle of April, and the seed is ripe in May, or early in June. The seed is furnished with an awn which ejects it from the husks almost immediately as it is perfected, and this seed is therefore rarely found in what are termed hay seeds, being shed long before the ordinary period of hay-harvest.

Fig. 2.

Dactylis Glomerata, or Round-panicled Cock's-foot Grass.

Specific character of distinction.—Panicle distinctly branched, flowers in dense globular tufts, directed to one side, corolla somewhat awned, five-ribbed, taper pointed. Native of Britain. —*Hort. Gram. Wob.* p. 136, *et seq.*

Dissections.—Fig. 1, spikelet magnified; 2, floret magnified; 3, nectary natural size.

On a rich sandy loam the produce of this grass about the middle of April is—

	Per Acre. *lbs.*
Herbage, or, green food	10209
Nutritive matter ditto	1169
At the time of flowering the produce is—Grass, or, green food	27905

	Per Acre. *lbs.*
Or, Hay	11859
Nutritive matter ditto	1069
At the time the seed is ripe the produce of grass is	26544
Or when made into hay	13272
Nutritive matter ditto	1451

The weight of nutritive matter in which the crop at the time the seed is ripe exceeds that of the flowering crop, is as seven to five nearly.

The seed of cock's-foot is light and the culms are comparatively succulent at this period of growth, which will account for the nutritive matter being then in a larger proportion. It should be observed also, that the crop at the period of flowering is more succulent and consequently more grateful to stock than the former, which circumstance counterbalances the value of the extra quantity of nutritive matter, and decides in favour of the period of flowering as the most proper to take the crop for hay. The fact of nutritive matter being abundant in the seed crop, will not be lost sight of in disposing of the culm, by those who save the seed of the cock's-foot.

The produce of lattermath is—

	Per Acre. *lbs.*
Herbage	11910
Nutritive matter in ditto	281

The proportional value which the lattermath of cock's-foot grass bears to that at the time of flowering, varies from five to three, and seven to two, according to the circumstances of soil and season.

This is one of the most valuable of the grasses. It springs very quickly after being cropped, and continues with little interruption productive throughout the season. Like every other of the more valuable pasture grasses, it will not when sown by itself form a close sward, but becomes tufty. When sown in certain proportions according to the soil, in combination with others, it is a very profitable plant. It requires to be depastured closely, under every circumstance, to reap the full advantage of its great merits. In the pastures most celebrated for fattening and keeping the largest quantity of stock in Devonshire, Lincolnshire, and in the vale of Aylesbury, which we minutely and carefully examined, we found cock's-foot in every instance to constitute a portion of the herbage. In the most skilfully managed of these pastures, the foliage or herbage of the cock's-foot was only to be distinguished by an experienced eye from that of the *Alopecurus pratensis*, *Poa pratensis*, *Poa trivialis*, *Lolium perenne*, *Cynosurus cristatus*, and other fine-leaved grasses, a fact which proves the futility of the objections which have been raised without due consideration against cock's-foot, as to its being a *coarse* grass. It wants only to be combined with others in due proportion to the nature of the soil, and judiciously depastured, to render it equal if not superior in value to any of the superior or essential pasture grasses.

The cock's-foot flowers from June till August, ripens its seed in July, or if the herbage of spring is eaten down to a late period, the seed does not ripen until August, or even the beginning of September. The late Mr. Rogers Parker, of Munden, Herts, was the first who collected the

seed in any considerable bulk for farm practice, which was afterwards extended and brought into more general notice by Mr. Coke, of Norfolk.

Fig. 3.
Alopecurus Pratensis, or Meadow Foxtail Grass.

Specific character of distinction.—Stem erect, smooth; spike somewhat panicled; husks or glumes of the calyx acute; hairy and connected at the base; shorter than the awn of the corolla. A native of Britain.—*Hort. Gram. Wob.* p. 139.

Dissections. —Fig. 1, calyx and floret mag.; 2, anthers; 3, style and germen mag; 4 and 5, style and germen natural size.

The produce of this grass, about the middle of April, from a clayey loam free from stagnant moisture, is—

	Per Acre. *lbs.*
Green food, ...	9598
Affording nutritive matter.	483
At the time of flowering—Herbage	20418

	Per Acre. lbs.
Or, Hay	11859
Nutritive matter ditto	1089
At the time the seed is ripe the produce of grass is	26544
Or when made into hay	13272
Nutritive matter ditto	1451

The weight of nutritive matter in which the crop at the time the se
ripe exceeds that of the flowering crop, is as seven to five nearly.

The seed of cock's-foot is light and the culms are compara
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the seed of the cock's-foot.

The produce of lattermath is—

	Per Acre. lbs.
Herbage	11910
Nutritive matter in ditto	281

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	Per Acre. lbs.
Dried, or, Hay ditto	6125
Affording of nutritive matter	478
At the time the seed is ripe—Herbage	12981
Dried, or made into hay	5819
Affording of nutritive matter	454

The culms of the meadow Foxtail grass continue succulent long after the seed is ripe, hence it is that the grass or culms of the flowering crop contains proportionably more water and less solid nutritive matter than the grass or herbage at the time the seed is ripe, a wise provision of bountiful providence in the natural economy of the essential permanent pasture grasses, by which the herbage of this and other early flowering grasses increases in nutritive properties until the seed is ripe, and by the time the general summer grasses are in flower (the period of growth at which these are most nutritive), the whole or all the essential species approximate to a state of perfection as to their value for hay, containing at this period less water and proportionally more solid nutritive matter. Did these early flowering grasses afford more nutritive food at their period of inflorescence (as is a general property of the summer, or commonly but erroneously called *hay-grasses*), then in that case their value would be greatly reduced inasmuch as the seeds ripen at an early season, and, were the culms to be reduced in nutritive properties by the ripening of the seeds, all that portion of the hay composed of these early grasses would be of an inferior quality, but which in fact is just the reverse.

The seeds of these more valuable early flowering essential perennial grasses are light and often defective, a circumstance which detracts from their otherwise great value because of the less facility afforded to their cultivation in the increased expense of saving or collecting their seeds.

For soils of an intermediate quality as to moisture and dryness, the Meadow Foxtail is one of the most valuable grasses for early growth, produce, and nutritive properties. In all the pastures most celebrated for fattening in England that we have examined, this grass constitutes a large proportion, and will be found to be cropped close by the stock. We found it more prevalent in Mr. Westcar's pastures, at Creslew, in the Vale of Aylesbury, than in any pastures of Devonshire or Lincolnshire.

The foxtail flowers in April, May, and in the beginning of June, and ripens the seed in June or July, according to the season of flowering, which depends on the nature of the soil, the weather, and the site of the pasture.

Fig. 4.

Poa Trivialis*, or *Rough-stalked Meadow Grass.

Specific character of distinction.—Panicle rather spreading, spikelets three-flowered; florets lanceolate, five ribbed connected by a web, stipula oblong, stem and leaves roughish; root fibrous.—*Hort. Gram. Wob.* p. 146.

Note.—The sharp-pointed sheath-scale of this species of Poa, distinguishes it with the greatest certainty from the *Poa pratensis*, with which it is often confounded.

Dissections.—Fig. 1, spikelet of three flowers; 2, calyx mag.; 3, corolla; 4, germen and feathered stigma.

When cultivated on a brown loam with manure, the produce of grass or green food is—

	Per Acre. *lbs.*
About the middle or latter end of June, when the grass is in flower	7486
Dried into hay	2946
Nutritive matter in ditto	233
When the seed is ripe the produce is—Grass or green food	7837

	Per Acre.
	lbs.
Made into hay	8522
Nutritive matter in ditto	336
The lattermath produce is—Grass	4764
Nutritive matter in ditto	223

The superior produce of this Poa, its highly nutritive properties, the particular seasons in which it arrives at perfection, and the marked partiality which oxen, horses, and sheep, have for it in pastures, are merits which distinguish it as one of the richest grasses for depasturing, on soils of a rich moist nature. On soils, however, of a light sandy dry nature it is of no value, the leaves become shrivelled up, the produce is not touched by the stock, and unless the culms happen to perfect seed the roots perish under such circumstances. It has in the course of these remarks been more than once already mentioned that all the essential permanent pasture grasses grow more luxuriantly, and continue longer in the soil as individual plants when they are combined with other species of the valuable grasses. It is the case with the present grass. There are no pastures celebrated for fattening properties or for dairy produce, but contain a portion of this grass. The nature of the soil as to whether it be inclined to moisture or to dryness, will determine the quantity of seed to be sown per acre in combination with others. This is a most valuable ingredient for water meadows. This is one of the grasses so highly spoken of in regard to the large produce of the Orcheston meadow in Wiltshire. Worlidge, who wrote in 1681, observes, " that at Maddington, in Wiltshire, about nine miles from Salisbury, grows a grass" (*Poa trivialis et Agrostis stolonifera var. latifolia*), " which grass in some years grows to a prodigious length, sometimes twenty-four feet long."—The seed is ripe about the middle of July.

Fig. 5.

Festuca Pratensis, or Meadow Fescue Grass.

Specific character of distinction.—Panicle nearly upright, spreading, branched, turned to one side; spikelets linear compressed; florets numerous, cylindrical, obscurely ribbed; nectary four cleft; root fibrous.—*Hort. Gram. Wob.* p. 149.

Dissections.—Fig. 1, germ and feathered stigmas; 2, four cleft nectary; 3. spikelets magnified shewing the florets and the calyx.

About the middle or latter end of April the produce of this grass on a fertile soil is—

	Per Acre. lbs.
Green food	10690
Nutritive matter	389
At the season of flowering the produce is—Grass or green herbage	13612

	Per Acre.
	lbs.
Affording nutritive matter	957
When made into hay, the produce weighs	6465
At the time the seed is ripe the produce is—Grass	19057
Hay	7623
Nutritive matter in ditto	380

Here the grass when left until the seed be ripe loses considerably in its nutritive powers. The seed is full and perfect, and the root and stem-leaves fade as the seed perfects. In those grasses which have light, and often imperfect seeds, as the Meadow Foxtail grass, &c. the culms and herbage are comparatively succulent and green at the time the seed is ripe, which will account for the difference between the quantities of nutritive matter contained in these grasses at the stages of growth now mentioned.

The Meadow Fescue constitutes a considerable portion of all rich natural pastures and irrigated meadows; it makes excellent hay, and though a large plant, the leaves or herbage are succulent, and apparently much liked by cattle. The plants never form rank tufts, as is the case with most of the larger grasses.

In the produce of early spring food this grass stands next in rank to the Meadow Foxtail, and is superior to Cock's-foot; but taking the produce of the whole season throughout, the Cock's-foot stands higher, from its superior reproductive powers.

It is of great importance when permanent pasture is an object, that the seed of rye-grass be not mistaken for that of the meadow fescue. The plants are very dissimilar, as a reference to the figures will shew. The meadow fescue delights in a deep loamy soil, where it constitutes one of the most valuable ingredients of a pasture. In Mr. Westcar's celebrated bullock pasture, at Creslew, in the Vale of Aylesbury, this grass was in a large proportion.

The *Festuca elatior* resembles this species in some degree, but it is coarser in every respect, and will not easily be mistaken for it, provided the characters of distinction given above be compared with the structure of the Festuca elatior.

Fig. 6.

Cynosurus Cristatus, or Crested Dog's-tail Grass.

Specific character of distinction.—Spike simple, linear; neuter spikelets without awns. Native of Britain.—*Hort. Gram. Wob.* p. 152.

Dissections, or parts of the flower.—Fig. 1, spikelets, shewing the floral leaves and neuter florets; 2, the same magnified: 3, fertile floret; 4, valves, or nectary.

At the time of flowering the produce of this grass is—

	Per Acre. lbs.
Green herbage	6125
Made into hay, weighs	1837
Nutritive matter, ditto	406
At the time the seed is ripe, the produce is—Grass	12251
Made into hay, weighs	4900
Affords of nutritive matter	478
The produce of latter-math is—Grass	3403
Nutritive matter	132

This grass at the time of flowering is more nutritive than at the time the seed is ripe, in the proportion of seventeen to ten. The quantity of grass at the time the seed is ripe is considerably greater than at the time of flowering; but the grass at the former period contains nearly twice the weight of nutritive matter; and when the lattermath, which would be produced during the time the seed was ripening, is added to this, it shews the superior advantage of taking the crop when the grass is in flower. The culms of this grass are of a wiry nature, and rejected by cattle generally; this circumstance will account for the nutritive matter being greater at the season of flowering. The seeds keep firm in the husks and are not easily shed; hence it is, that in winter when the ground is covered with snow, the seed spikes or culms of the crested dog's-tail grass are seen above its surface, attracting groups of partridges and smaller birds generally. There is hardly a grass more frequently met with than the crested dog's-tail, in pastures properly so called, for it will continue permanent in very dry sandy soils, as well as in every gradation of soil from that to the stagnant bog. It arrives at the greatest perfection in soils of a medium quality as to moisture and dryness; in irrigated meadows, judiciously formed so that the water cannot stagnate, the crested dog's-tail grass attains to the largest growth. The produce of early herbage in the spring is inferior to most other grasses in weight, although its hardy nature, by giving it a superior verdure, may deceive the casual observer in this respect. It forms a dense close sward when combined with the other essential grasses; and, a superior permanent pasture cannot be formed without a proportion of it being allowed, according to the nature of the soil. In all the most celebrated pastures we have examined, it constituted a considerable portion of the produce. It flowers about the middle or towards the end of June, and ripens the seed in July.

Fig. 7.
Holcus Avenaceus, or Tall Oat-like Soft-Grass.

Specific character of distinction.—Calyx smooth, barren floret lowest, with a sharply bent prominent awn; fertile floret slightly elevated, scarcely awned; leaves long, "rather thin"; root knobbed or bulbous.—*Hort. Gram. Wob.* p. 169.

Dissections.—Fig. 1, calyx; 2, neuter flower, shewing the bent and twisted awn the character of avena; 3, male part, or anthers; 4, germen or female flower; 5, nectary.

In the works of Linnæus, Curtis, Host, Hudson, and Stillingfleet, this grass is described under the name of *Avena elatior*, or tall oat-grass; the fact is, that the botanical characters of the plant partake in part of the essential discriminating character of Avena and that of Holcus, and consequently this plant is the connecting link between the genera, or, families of Holci and Avenæ, and in a less degree with the Airæ, or, Hair-grasses; and affords a beautiful illustration of the natural affinity of plants. The bent and twisted awn from the back of the blossom, is an essential character of the oat (Avena), and the fertile and neuter floret enclosed in one calyx belongs to the soft grass (Holcus). The nutritive matter of this species approaches nearer in properties to that of the oat grasses than

to that of the *Holcus lanatus* or *Holcus mollis*; it contains a larger proportion of bitter extractive and saline matters than the former, which afford a large proportion of mucilage. The produce of herbage in the spring is considerable, the summer produce is heavy. It constitutes but a small proportion of the herbage of the best natural pastures; it is, however, always present more or less, and where injudicious management by too frequent mowings has impoverished the quality of pastures, as on clayey or peaty soils, the Holcus avenaceus is found to increase and almost overcome the finer-leaved grasses. The root propagates by bulbs, and on that account it should never be sown on land intended to be again broken up for tillage crops; but where a meadow is intended to remain permanent, a moderate proportion of the seed should be sown, perhaps from one to two pecks per acre, combined with the other essential grasses. The nutritive matter, containing a considerable proportion of tonic matter, doubtless renders it a valuable ingredient of a pasture, although its quantity should be limited. It flowers towards the end of June, and ripens the seed in July.

Fig. 8.

Phleum Pratense, var. majus., or Larger Variety of Meadow Cat's-tail or Timothy Grass.

Specific character of distinction.—Spike cylindrical, very long, calyx fringed and awned; culms upright.

Dissections.—Fig. 1, nectary, germen, and stigmas, on the long styles; 3, calyx magnified, shewing the fringes—the same the natural size, 2; 4, the corolla and stamens.

It is of great importance to the agriculturist to be able to distinguish this variety from the next following, which is worthless, while this is highly valuable. The difference in the size will generally point out the true variety, but as the nature of soils varies the sizes of different plants, this character of distinction cannot alone be depended on; we have, therefore, given a figure of both varieties, which, with the accompanying botanical characters, will afford certain means of distinguishing the true from the spurious. There is another species of cat's-tail grass very common in damp clayey soils, which is often confounded with the first and valuable variety, but in this the culms or stems are not upright throughout, but have the first joint from the root knee bent and swoln larger than the rest, this, on a careful inspection, will always detect this worthless species, which is, if possible, lower in the scale than the smaller variety of timothy grass, *Phleum pratense var. minus.*

About the middle of April the produce from a clayey soil is—

	Per Acre. *lbs.*
Grass	5445
Nutritive matter	223
At the time of flowering the produce is,—Grass	40837
Made into hay, weighs	17355
Affords of nutritive matter	1595
At the time the seed is ripe the produce is—Grass	40837
Makes hay	19397
Affords of nutritive matter	3668
The produce of lattermath is—Grass	9528
Nutritive matter	297

The culms of this grass, at the time the seed is ripe, contain more nutritive matter than those of any other species of grass which we have proved. In regard to the early produce of herbage in the spring, it is superior to cock's-foot grass. The weight of grass produced by each species at this season is nearly equal, but the nutritive powers of the herbage of the timothy is superior to the cock's-foot in the proportion of nine to eight. Though the nutritive matter contained in the seed crop is greater than at the season of flowering, nevertheless the seed of the lattermath, or the produce of herbage which would follow the period from flowering to seeding, would greatly outweigh this advantage, and it is therefore proper to take the crop when the plant is in flower, or a little after, but before the seed be perfected. When the season is dry the crop should be taken as soon as the flowering spikes shew their anthers; but when moist and cloudy, it is more profitable to suffer a week or a fortnight to elapse before cutting for hay. This grass, though a native of Britain, and far from being uncommon, was first introduced to British farming from America in 1763, by Mr. Wynch. It is said to have received the quaint name of timothy grass, from Mr. Timothy Hanson having first brought the seeds from New York to Carolina, in 1763. It delights in a rich clayey loam; stagnant moisture is destructive of this grass, as it is of all others of the essential grasses. It is not adapted for dry sandy soils, but in all those of an intermediate quality it is permanent and valuable when combined in a due proportion with others.

It makes a nutritive hay, particularly for horses. When saved for seed

the straw is used for hay, and the nutritive matter shewn in the above details to exist in the culms when the seed is ripe, is confirmed by the above fact, and by the seed-grower's practice. The quantity of seed in general cases for an acre, combined with a due proportion of other grasses, is five pounds. It flowers about the third week of June, and ripens the seed in July.

Fig 9.

Phleum Pratense, var. minus, or Smaller Variety of Meadow Cat's-tail or Timothy Grass.

Specific character of distinction.—Differs from the true timothy in having the dagger-like points of the calyx (dissection, fig. 1.) longer, and recurved; the husks are longer in every respect, and less ciliated or fringed. The culms are almost covered with the sheaths of the leaves, the joints of the straw are less swoln, and it does not grow upright but ascending, and the root is more like a bulb.

Dissections.—Fig. 1, shewing the fringes to terminate abruptly before they reach the base of the dagger like point of the husk or glume.

On a soil of the best quality, the produce of this grass in weight scarcely reaches one-third of the large meadow cat's-tail; the nutritive matter is in

proportion inferior, and cattle appear to dislike it much, and it is a grass to be avoided. It is very common in damp clayey soils, as well as in those that are drier. The proportional value which the produce of this variety bears to that of the former is as twenty-five to eight, a fact which shews the importance of distinguishing one variety of grass from another, when their value is so disproportionate at the same time that their specific or botanical characters of distinction are so much alike. The seeds of each variety are so much alike as scarcely to be distinguished from each other. The seed of this variety is about one-third smaller, and of a rounder shape than that of the true timothy grass.*

This spurious variety of timothy grass, flowers and perfects its seed about a week later than the true variety.

Fig. 10.
Lolium Perenne, or Rye Grass.

* The seeds of these grasses are figured in the Hort. Gram. Wob. p. 19, 28.

Specific character of distinction.—Spike awnless; calyx shorter than the spikelet; florets lanceolate.—*Hort. Gram. Wob.* p. 211.

Dissections. Fig. 1, spikelet; 2, floret; 3, germen and stigmas; 4, nectary.

The varieties of this well-known species of grass are numerous, and are chiefly distinguished from each other by the size of the spikelet (*fig.* 1.) and the size and disposition of the leaves; but they are all distinguished from every other species of any other genus of grasses, by having only one valve or husk to the calyx, which is situated on the outside of the spikelet, and nearly two-thirds its length. It is of some consequence to attend to this point, as it is a discriminating character which may be easily seen, and which never varies under any circumstance whatever.

There are hardly any two grasses more dissimilar in structure than the meadow fescue, (*fig.* 7.), and the rye grass; yet, notwithstanding in common practice, they are most frequently mistaken for each other, a circumstance of serious consequence when a permanent pasture or meadow is an object. The meadow fescue, on referring to *fig.* 7, will be found to bear its flowers on a panicle or spreading branches subdivided, while the rye-grass bears its flowers and seed on a close spike; by observing this distinction all danger of mistaking rye-grass for the meadow fescue or any panicled grass will be obviated, and by observing the calyx as before described, no species of spiked grass can be mistaken for rye-grass.

Among the numerous varieties of rye-grass, the following are the most interesting to the agriculturist.

1. Common rye-grass. 2. Broad-spiked rye-grass. 3. Pacey's. 4. Russell's, Ruck's, Whitworth's and Stickney's. The first is well known as lasting but one year in full produce, and where (as in the alternate husbandry) only one year's ley is required or practised, this is used. It is known in the seed trade under the name of annual rye-grass, but it is not strictly annual, for in some soils it will continue several years, or at least individual plants will continue. The annual rye-grass, properly so called, is the darnel weed of some counties, as the *Bromus squarrosus* is of others. Pacey's rye-grass is a valuable variety on most soils. It is distinguished from the others by its nearly upright spike, the spikelets are shorter, the glumes more pointed, and the culms furnished with long leaves. The Russell rye-grass was first brought into notice by the late Mr. Benjamin Holdich. The plant from which he raised the seeds was pointed out to Mr. Holdich by John, Duke of Bedford, in Thorney fens, from which circumstance he named it in honour of the Duke. The spikes of this variety are strong, the spikelets pointed, and the seed small. The root leaves are more numerous than of any other variety of rye-grass, and it perfects less seed in a given space. This habit of growth renders it more permanent and valuable for depasturing on deep loamy or peaty soils, than any other variety of rye-grass at present known. It is hoped the above description* will enable those interested in the subject of these varieties, to distinguish this from others of less value. Ruck's rye-grass has the spikes long, the culms or straw numerous, with large leaves, exhibiting a habit of robustness. It produces seed largely, which weighs in general heavier than any of the varieties named. Its duration is considerably less than that of the preceding. Stickney's rye-grass approaches nearer to that of the Russell rye-grass than any other of those now brought under consideration. The spikes are more diverging, and the spikelets distant; the root leaves broad and less thickly produced. Whitworth's

* The plant is figured in the Hort. Gram. Wob.

rye-grass is distinguished for the fineness of its foliage. These varieties have each peculiar merits for local circumstances of soil. In all deep soils of the best quality for permanent pasture, the Russell rye-grass will be found by far the most valuable. For high wold lands, Whitworth's, and Pacey's improved rye-grasses are well adapted.

The natural habit of rye-grass is to produce much and comparatively heavy seed, this property renders it not only an unprofitable impoverisher of the ground, compared with cock's-foot and other species, but also a troublesome weed in the wheat crop when that follows it in the rotation. The produce is chiefly in the spring, for the Midsummer and aftermath crop of herbage is always deficient. On the other hand, rye-grass is valuable for spring produce, its seed vegetates in a superior manner, is easily collected, and is less expensive at first. If the produce and nutritive powers of rye-grass be compared with those of cock's-foot grass, it will be found inferior in the proportion of eighteen to eight nearly; to meadow foxtail in the proportion of twelve to five; and to the meadow fescue in the proportion of seventeen to five. In the comparisons from which the above estimates were made, the crops at the time of perfecting the seed were omitted for the sake of comparison. In the alternate husbandry, rye-grass possesses the valuable property of arriving soon at perfection from seed. The meadow foxtail, which is greatly superior to rye-grass in early growth and weight of produce, is defective in its seed, and like the meadow fescue does not attain perfection in one season. The objections to rye-grass in the alternate husbandry, may be greatly removed by combining with it a portion of cock's-foot, timothy, meadow fescue, and meadow foxtail grasses. The aftermath produce would be found double in quantity that of rye-grass and clover alone; and should it happen on any occasion to be desirable to continue the ley more than one year, the pasture would improve instead of diminish in the produce of pasturage. Another advantage is the superior quantity of vegetable matter which this mixture of different grasses affords to the soil when ploughed in.

Rye-grass appears to have been cultivated previous to 1677*. The usual quantity of rye-grass seed sown per acre in the alternate husbandry, is two pecks with fourteen pounds of clover; a quantity too small to stock the surface with plants, and consequently a large space of the soil is left unoccupied by the numerous vacancies between them.

Rye-grass comes into flower about the second week of June the first year from seed, but as the plants become older they flower much later. The seed ripens in about twenty-five days after flowering, according to the state of the weather.

The *Agrostis stolonifera var. latifolia*, or broad-leaved creeping bent, is one of the essential permanent pasture grasses. This grass withstands the effects of dry weather in pastures; it affords a large portion of the autumn and winter produce of pastures. It should, however, be combined in a moderate proportion with the other grasses; on an average of soils two pounds of seed to the acre will be sufficient. It is of great importance that the seed be genuine, for there are several species of agrostis similar to this in the seed, but which are worthless or rather mischievous plants, as the *Agrostis stolonifera angustifolia*, *Agrostis vulgaris*, *Agros-*

* See the first edition of Woldrige's Husbandry—my edition is that of 1681. He enumerates saintfoin, lucerne, trefoil or clover, tares, and spurry, as grasses, and mentions rye-grass only of the proper or natural grasses, as known to the agriculturists of that day.

tis fascicularis, &c. all which should be guarded against with the utmost care.

The *Poa pratensis*, or smooth meadow grass, is essential for dry soils, and is a nutritive grass. It assists most materially in forming what is termed a close bottom. It has creeping roots as couch, and therefore is inadmissible in lands intended to be broken up for tillage. On loamy or moist lands it is of no value, the *Poa trivialis* is here its proper substitute.

The *Festuca duriuscula*, or hard fescue, is one of the most valuable Down grasses, for where it constitutes a principal portion of the herbage, the South-down sheep thrive best.

The *Avena flavescens*, or golden oat grass, is another valuable Down grass, and is always present in the best of these pastures. It does not spring very early, but affords a good bite at a time when some of the other grasses are in a state of rest, or in weakened vigour of growth. This grass is also found in the best meadows, and thrives under irrigation.

The *Festuca ovina*, or sheep's fescue, is of so diminutive a size, and the produce of it so insignificant, as to exclude it entirely from farm practice. It makes a very useful ingredient in a mixture of fine-leaved dwarf grasses for flower garden or pleasure ground lawns.

The *Hordeum pratense*, or meadow barley grass, in some kinds of soil is a valuable constituent of the pasture. In the Isle of Thanet it constitutes a large proportion of the marsh pastures. It should however be sparingly introduced. On soils suitable for it one peck of the seed per acre, in conjunction with such essential grasses as are adapted to the soil, will be found sufficient. The seed is light, and, by reason of its awns, bulky.

The *Poa annua*, or Suffolk-grass, is so short of growth, and so little productive, as to render it an incumberer of the soil. It is a most troublesome weed in gravel walks, stone pitchings, and in gardens. A liberal dressing of common salt will destroy it on stone pitchings, but on walks the application hurts the appearance of the surface, and in the latter instance the plants in crop, as well as the weed, will suffer by it.

The *Avena pratensis*, or meadow oat-grass, is not so frequently in pastures as the spurious grasses above enumerated. Its smooth and succulent herbage, which is eaten readily by stock, might recommend it for culture, but its deficiency of produce forbids its culture when the seeds of the more valuable species can be obtained.

The *Bromus arvensis*, or field brome grass, is strictly an annual plant, but, nevertheless, is found in some of the best pastures. It cannot be recommended for cultivation, but it possesses properties which render its presence not an object of regret like that of the *Bromus mollis*, or soft brome grass. The former contains a considerable portion of nutritive matter, and when the seed sheds about hay harvest, they vegetate among the root-leaves of the sward; vegetate quickly, and afford young grass through the winter and early in spring. The soft brome grass is very unpalatable to cattle, and the produce consists chiefly of seed; the stem, even before the grass is in flower, is almost destitute of foliage. In all poor, exhausted, or badly managed soils, this grass prevails, much to the loss and damage of the occupiers. It comes early into flower, and soon ripens and sheds its seed. The best mode of eradicating it, is to mow before the seed is perfected. When the soil is poor, and the general herbage inferior, then there is no remedy but to break up; take a course of crops on well-manured fallows, the first naked and the others

green, and finish this course by sowing down with genuine seeds of the superior permanent pasture grasses.

Holcus lanatus, Woolly soft grass, Yorkshire whites, Yorkshire fog. This grass is very common, and grows on all soils from the richest to the poorest. It attains to the greatest degree of luxuriance on light moist soils, particularly on those of a peaty nature. Cattle prefer almost any other grass to this; it is seen in pastures with its full-grown downy leaves entire, while the grasses which surround it are eaten to the roots. The numerous downy hairs which cover the whole plant, render the hay which is made of it soft and spongy, and in this state it is also disliked by cattle, particularly by horses. The nutritive matter consists almost entirely of mucilage and sugar. The grasses most liked by cattle have always a portion of bitter extractive and saline matters, as constituents of their nutritive principle. This grass, however objectionable in lands capable of growing the superior grasses, is yet of value on high, poor, exposed soils, there it affords a larger supply of food than any other grass, but it should not be introduced without grave consideration. The seeds are light and easily dispersed by the winds, and when once in possession of a soil, particularly of a moist and light one, there is scarcely any means that will get rid of it, without a course of fallow and clean tillage. It flowers in June and July, and ripens the seed in the latter month.

The *Poa nemoralis angustifolia* is a valuable grass for early spring produce, and for nutritive properties, but the seed of it has not yet been obtained in sufficient quantities for farm practice; the like observation applies to the *Poa angustifolia*, and *Poa nervata*, all grasses of foreign origin. The above species, it is hardly necessary to observe, belong to the true or proper grasses, but a permanent pasture of the best quality cannot be formed without an admixture of some of the clovers or artificial grasses with these, as was before shewn when the composition of such pastures was investigated. The *Trifolium repens*, or white creeping or Dutch clover, is an essential ingredient in every pasture, and it will grow in every kind of soil where the proper pasture grasses can exist. A plant so well known to every farmer need not be described here. The quantity of seed per acre should never be less than five pounds, in combination with the proper grasses, in some soils with these, eight lbs. per acre will not be too much.

The Perennial Red Clover, or Cow Grass, *Trifolium pratense perenne*, is another essential constituent of the richest natural meadows, but it is not so easily made permanent in some kinds of soils, as those which are deep and moist in the subsoil, and those which are very dry and sandy, as the white clover. The white clover has a fibrous root, like the perennial red clover, but it has also the property or power of striking root at the joints of the stems, like the strawberry. This property enables the plant to exist in soils having the wettest subsoil, as also on the driest sands; on the contrary, the deep-striking root of the cow-grass clover perishes when in contact with a wet subsoil, and on dry land it has only one resource in case of drought, which is subsoil moisture, which the dews and light rains cannot reach. The quantity of seed of this species per acre, ought, in an average of cases as to soils, be about half that of the white or Dutch clover.

The *Vicia sepium*, or creeping vetch, is one of the most nutritive of the pasture plants, and, could the seeds be obtained at a reasonable price, it would render the selection alluded to complete. It comes early in the

spring, and cattle are extremely fond of it. It has been found to advance poor stock, or those in the lowest condition, to a state of fatness faster than any other green food. The seeds ripen in succession, and, as the pods perfect, they burst and shed the seed—hence the difficulty of collecting the seed in proper quantities for general practice.

The Yarrow, *Achillea millefolium*, is a useful constituent of the richest natural pastures; it possesses a bitter saline or tonic principle, which renders pastures more salubrious for the health or digestive functions of cattle. In damp or moist seasons, this beneficial effect has been more generally observed. It ought to be introduced in small quantities only, from two ounces to three quarters of a pound per acre, will be found sufficient. The seed is very minute—a small quantity produces a great number of plants.

Rib grass, lamb's tongue, &c. or *Plantago lanceolata*, has been, and is with many, a favourite plant to sow for pasture. The seed is cheap, and easily procured also; it vegetates readily on almost any kind of soil, and soon assumes the green hue of a sheep pasture. This plant, however, contains proportionably but little nutritive matter, and its produce is very inconsiderable compared with any of the plants mentioned. In very poor high exposed situations, where the superior grasses will not succeed so well, it is doubtless useful; but, to sow this plant on soils of the best quality, or even on those of a secondary nature, is occupying the soil unprofitably, as may be demonstrated by any one who will sow a part with this and a part with the grasses recommended, and ascertain exactly the in produce.

Red suckling, *Trifolium minus*, is a valuable clover in poor dry soils. Though an annual it withstands the effects of drought in clayey as well as in sandy soils, when such lands are situated on a declivity. It will produce flowers and seed when not more than an inch in height; in this way it propagates itself under any disadvantage of close cropping. Its utility, however, is confined to those peculiarities of soil, and should constitute but a moderate proportion of the herbage.

The last pasture plant we may here notice, is the trefoil, black nonsuch, or *Medicago lupulina*. This is only a biennial, or in some soils an annual plant, but it is highly useful in light soils to combine with other grasses. There are several biennials which grow slow for the first and second years from seed. Such as the trefoil, rye-grass, and perennial red clover, which are useful in producing an immediate crop, until, in the second year, the more permanent grasses have become established, and in full possession of the surface.

Such is an outline of the natural habits, properties, and comparative value of the proper grasses which constitute the produce of the richest permanent pastures and meadows. To have entered into more minute details of the results of the various and long-continued experiments or cultivation of all these grasses individually, and also combined in different proportions on soils of almost every description*, would exceed the limits of these pages. What has now been stated may be sufficient to shew, in some measure, that a permanent pasture of the best quality for nutritive qualities, early growth, produce, and reproductive powers, cannot be obtained from one or two species of grasses and clovers only, but by the employment of

* See "Hortus Gramineus Woburnensis," for details of analysis of various kinds of soils connected with the growth and cultivation of the permanent pasture grasses.

many different species, combined in such proportions as are adapted to ensure permanency in each peculiar variety of soil. The following grasses are superior to all others in one or more of the essential properties before alluded to, as nutritive powers, early growth, produce, reproductive powers, permanency, and the facilities they offer for propagation by ripening seed.

The proportion in which the seeds should be combined for six acres of land of the best quality are:—

1. Cock's-foot grass, *Dactylis glomerata*	2 Bush.
2. Meadow fescue, *Festuca pratensis*	2
3. Meadow Foxtail, *Alopecurus pratensis*	2
4. Rough-stalked meadow grass, *Poa trivialis*	2
5. Tall oat-like soft-grass, *Holcus avenaceus*	0½
6. Meadow cat's-tail, *Phleum pratense majus*	15 Pounds
7. Hard or smooth fescue grass, *Festuca duriuscula, vel. glabra*	1 Bush.
8. Crested dog's-tail grass, *Cynosurus cristatus*	1
9. Nerved meadow grass, *Poa nervata*	0½
10. Wood meadow grass, *Poa nemoralis*	1
11. Narrow-leaved meadow grass, *Poa angustifolia*	0½
12. Broad-leaved creeping bent, or fiorin, *Agrostis stolonifera, var. latifolia*	0½
13. Rye grass, *Lolium perenne*	1
14. White or Dutch clover, *Trifolium repens*	15 Pounds
15. Bush vetch, *Vicia sepium*	0½ Bush.
16. Sweet scented vernal grass, *Anthoxanthum odoratum*	0½
17. Perennial red clover, *Trifolium pratense perenne*	12 Pounds
18. Yarrow, *Achillea millefolium*	4

The above measures and weights of seeds amount to about fifteen bushels, the quantity required for six acres of land of the best quality already described, and which allows ten pecks to the acre.

Of the numerous different combinations of grasses which have been made trial of, that which is now stated proved the best for the soil in question. The seeds of Nos. 9, 10, 11, and 15, are however not yet to be procured in such quantities, and at such moderate prices, as to make them available for general farm practice. If we refer back to what was before stated respecting the number of plants contained in every square foot of the turf of the richest natural pastures, and compare with that the number of seeds contained in the above fifteen bushels of the different species of grasses enumerated, we shall find (after a little allowance for accidental failures in the vegetation of the seed), that the number of plants will be as near as possible equal to the number of these seeds. The seeds of the different species vary greatly in size, and consequently where the smaller seeded species are in a less proportion or omitted altogether in any combination or mixture of the essential grasses for permanent pasture, the measure of seeds per acre will be increased in proportion as the larger seeded species prevail; and on the contrary, the measure per acre will be less in proportion as the smaller seeds prevail, although the number of seeds shall be the same in both. In the present mixture of seeds, Nos. 4, 6, 8, 9, 10, 11, 12, 14, 15, 17, and 18, come under the denomination of small heavy seeds, and the others under that of the larger and light-seeded grasses. It is therefore evident that the want of the nerved meadow grass, No. 9; wood meadow grass, 10; narrow-leaved meadow grass, 11; and bush vetch, 15; should be supplied by adding to the quantities or proportions of those species in the mixture, which most nearly resemble these which cannot be obtained in natural habits and properties. In this case, by adding one bushel to the cock's-foot, one to the hard or smooth fescue, one and a half to the meadow cat's-tail, one to the dog's-tail, two to the perennial rye-grass, one to the sweet vernal, one

and a half to the white clover, and half to the perennial rye-grass, one to the sweet vernal, one and a half to the white clover, and half to the perennial red clover, the measure will be increased to eighteen bushels, or to the rate of twelve pecks for the acre; yet the number of plants to every square foot of surface will be the same as at first in the ten pecks per acre.

These may appear minute matters and troublesome, practice, however, will shew their importance as regards successful and satisfactory results, and will also render the execution easy. They will be found essential to prevent unnecessary expenditure of seed, and likewise to avoid the smallest waste of ground by leaving vacant spaces for the introduction of spurious grasses, moss, or weeds, from the more common practice of a deficiency of seed. The same principle, that of sowing seed in such quantity as will produce or ensure a certain number of plants on a given space of ground, is applicable and should be followed in varying the proportions of the different species of these grasses to suit particular soils. Were we to describe the numerous varieties of soils in that manner which is absolutely requisite to render them intelligible to the practical reader, and also the varying proportions of the different species of the essential permanent pasture grasses adapted for each, we should far exceed the limits of these pages. To describe, therefore, the various grasses adapted for every variety of soil, without the chemical properties of each being fully detailed, would tend rather to mislead than inform our readers. For this reason, we have given as above a general rule for soils of the best quality, and we shall here insert another for light sandy soils of an inferior nature.

	Pecks per Acre.
Cock's-foot grass	3¼
Improved Pacy's, or Russell rye grass	3¼
Hard or smooth fescue	2¼
Smooth meadow grass	0¾
Cat's-tail grass	0¼
Sweet-scented vernal grass	0¼
Broad-leaved creeping bent, or fiorin	0¼
Golden oat grass, (*Avena flavescens*)	0½
Crested dog's-tail	0½
White clover	0¼
Trefoil, (*Medicago lupulina*)	0¾
Red suckling, (*Trifolium minus*)	0¾

or at the rate of three bushels and one peck per acre.

That law in the natural economy of the grasses mentioned at the beginning of this subject, renders it necessary that the surface of the soil intended for permanent pastures of the best quality, should be fully stocked with plants at once, and in the due proportions of the different species of grasses which are best adapted to each particular variety of soil; as the clayey, peaty, chalky, gravelly, and siliceous sandy varieties.

Having now enumerated what kinds of grasses are best adapted for permanent pasture of the best quality, we shall now shortly discuss:—1. The preparation of the soil for the reception of the seeds. 2. The best seasons for sowing. 3. The mode of sowing. 4. The after management of the pasture:—

1. We have already stated more than once in the course of these remarks, that not one species or variety of the superior permanent pasture grasses, will thrive or grow where stagnant moisture exists; the first and most essential preparation of a soil for the reception of the seeds of

these valuable grasses, is therefore to render it free of stagnant moisture, for every other operation with the view of forming a productive nutritive permanent meadow will be fruitless. The various modes of draining land, according to the circumstances of soil and the command of suitable materials, &c. are so well understood that we need not dwell upon that point here. Next to that of having the land free of stagnant moisture, is that of having it perfectly clean or free from all root or seed weeds.

It is of great importance that the soil, previously to sowing, should be what is termed in good heart, or in as rich a state as circumstances will allow; however, should the two former conditions, draining and cleanliness be fulfilled, the last mentioned, that of richness or good heart, may be afterwards supplied by top dressings of compost and rotten dung.

The surface or tilth should be made as fine and level as possible. The first ploughing ought to be deep, the secondary ones shallow. It is of great service in establishing the roots of the seedling grasses during the first stages of their growth, to apply a top dressing of well-pulverized dung or fine compost on the finely prepared tilth on which the seeds are to be sown and harrowed into the soil with them. This surface application of manure as a seed bed, is to be considered independent of the usual supply of manure turned in by the plough. Seedling grasses are very apt to suffer greatly by a course of dry hot weather succeeding their germination; but the finely divided manure of the top dressing invigorates the tender roots, and has the beneficial property of rendering the young plants proof against the bad effects of extremes of weather.

2. The best season for sowing the seeds of the grasses is the autumn, but to this there are several exceptions, as a cold soil and exposed situation, when the soil is foul or imperfectly cleared of weeds, and in every case where the land is subject to local or temporary wetness in winter and early in spring; which no draining, however perfect, can always prevent. Autumn sowing is not to be preferred. When the land is clean and in a fertile state, the seeds of these grasses will succeed perfectly if sown in the beginning of spring, from March to the middle of May; and, indeed, should the weather be sufficiently moist, they may be sown with every certainty of success until September, provided the condition of the land, its preparation, and the quality of the seeds, be satisfactory. Lord Viscount Maitland sowed down to permanent pasture a considerable extent of land at Thirlstane castle, the seat of the Earl of Lauderdale. The seeds were sown about the middle or towards the end of June, without any admixture of corn crop, and the produce of grass the same season, was estimated at one ton and a half per acre. In this instance, however, the soil was clean and in good heart, the different species of grasses were combined in just proportions to the nature of the soil, and were sown down in the most judicious manner; at the same time a moist state of weather favoured all the operations, except that of reaping the crop for hay.

3. It may be almost necessary to observe, that clean seeds, genuine or true to the species, must be obtained, or disappointment is as certain to follow the operations, as would the sowing of oats in the expectation of wheat.

It has been already mentioned, that the seeds of the different grasses naturally divide themselves into *light* and *heavy* seeds. When these different kinds of seeds are mixed together, and in this state attempted to be sown, they fall very irregularly from the hand, or from a sowing machine if used for the purpose. It was before stated, that an intimate

combination or mixture of different species of grasses was one principal cause of the permanency and productiveness of the individual species, as also of the dense, or close bottom, so peculiar to ancient natural pastures. To ensure therefore the equal and regular distribution of the seeds of all the different species over the surface of the soil, as we find them in the richest natural pastures, it is necessary to combine the seeds in two separate mixtures, the light seeds by themselves and the heavy seeds by themselves also, and to give each mixture a separate cast or sowing. The lighter, which are also the larger seeds, require a somewhat deeper covering than the heavy and smaller seeds; on that account it is better to sow the light mixture first all over the surface as equally as possible, and then the heavy mixture in like manner. The short-toothed harrows are perhaps the best implements for covering the seeds.

When land is sown for permanent pastures, no admixture of any annual or grain crop, or broad-leaved clover, should be admitted with the grass seeds. Experience proves that they are highly injurious to the intention of speedily forming a solid productive sward; and that the profit that may accrue from a grain crop thus obtained, will be much overbalanced by the loss of grass in the two following seasons. Every plant of these annual crops occupies a place, to the detriment of the expected sward; besides rendering the surface porous by the decay of their roots in the end of autumn; much mischief likewise is done to the sward by portions of the crops being beat down with heavy rains. In a word, a crop of corn acts towards the perennial grasses as a towering crop of weeds acts towards a corn crop itself. Land sown down for one or two years, as in the alternate husbandry, is of course excluded from this rule, for a corn crop is here essential; besides, rye-grass, cock's-foot, and meadow cat's-tail grasses, with the clovers, are the grasses best adapted for this purpose, as they are more capable of contending against the efforts of an annual or corn crop to extract the moisture and nourishment of the soil, at a time too when the grasses are in a tender seedling state. There is no view more mistaken than that which would lead to the belief of the seedling permanent pasture grasses requiring, or being benefitted by shelter or shade of any kind whatever, and, particularly by stronger growing plants, which divide with them the moisture and nourishment of the soil.

4. There has been some difference of opinion respecting the manner of reaping the produce of seedling grasses, whether by depasturing with sheep, or by mowing after the plants have perfected their seed. The manure supplied by sheep to the young grasses is of great advantage; but the animals are apt to bite too close to the root, and sometimes tear up the young plants altogether. We have found, on repeated trials, that cropping seedling grasses before they had produced flowers, had the effect of retarding and weakening the after-growth of the plants for that season very much. But after the period of flowering, cropping was found to strengthen and rather encourage the growth of the plants. In the same way we found that old plants of grass when cut very close after the first shoots of the spring made their appearance, afforded about one-third less weight of produce in the whole season than those plants of the same species which were left uncut till the flowering culms began to appear. As the advantages of the manure of the sheep may be supplied by top-dressing, and the disadvantages resulting to the tender seedling plants from early and close cropping cannot so speedily be removed, the practice of suffering the grasses to produce flowers before they are cut, with the application of

top-dressings, and the use of the roller, till the spring of the second year, appears to be far more profitable than the former practice of depasturing the seedling grasses at an earlier period than the spring of the second year. But in this no doubt, as well as in other particular modes of management recommended for general practice in the culture of plants, local circumstances may interfere so much as often to render some modification of them necessary. As for instance when the soil is rich, in that case the grasses, or the greater part of them, should be suffered to come into flower, then mown for hay: the aftermath, so soon as it reaches some inches in height, should be depastured. In the opposite case of a poor sandy or gravelly soil, depasturing the seedling grasses without mowing for hay is the most profitable management; we may mention one instance out of many within our experience. A field of twenty-five acres, of a poor gravelly soil, worn out with corn crops, was required to be laid down to sheep lawn the first season. In the beginning of March the first ploughing was given, and the process of cleaning was carried on till the middle of April, with intervals, according as the weather was favourable. Ten loads of manure was given per acre; the seeds were sown the first week of May. The kinds of grasses employed, were the same as those already mentioned for light sandy soils. The weather was unfavourable at first, being cold and dry, but afterwards a course of genial moist warm weather, produced a full vegetation of the seeds. As soon as the earlier flowering grasses began to shew their flowering spikes or culms, sheep were put on to depasture. The flock had theli berty of the field during the day, but were folded every night regularly, until the whole field was gone over. The sheep did remarkably well, and were sold at a profit of about seven shillings a head by the end of the season. The sheep did not touch the folded spaces again, until the grasses had formed a close bottom, and had attained to a good length, towards the end of autumn. This pasture is not now to be distinguished from a natural sheep lawn of the best quality. The land in question was immediately connected with a neglected mansion which was put in repair at the time mentioned.*

But though the pasture be formed in the best manner, with a combination of the most valuable grasses, nevertheless, a judicious mode of treatment afterwards is as essentially necessary to continue its value. By proper stocking, top dressing, and weeding, very indifferent pastures (where the soil was adapted to the growth of grass) have been brought to a state equal to the most valuable; and, on the contrary, the richest natural pastures, by neglect of proper stocking, top-dressing, and weeding, or too frequent repetition of hay crops, have become so unprofitable, as to require many years to bring them again to their original value. We have witnessed in Lincolnshire, soils of a similar nature in every respect, indeed a fence only separating them, exhibit the effects of injudicious and of bad treatment as regards the frequent repetition of hay crops on the

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* Among the numerous instances which might be quoted from our personal knowledge, shewing the success of this new mode of returning land to permanent pasture of the best quality, in one, or in two seasons at most, on different kinds of soil variously situated as to elevation and local climate, the following may be referred to. Peaty soils, covered with coarse, worthless herbage, may be drained, pared and burnt, and the proper mixture of grass

same field. On one side of the fence, where judicious stocking had been practised, the superior grasses wholly occupied the field, nor could we observe an inferior plant in the herbage of it, much less absolute weeds; but on the other side of the fence, where the field had been mown for a succession of years, the superior grasses had given place to the cow-parsnip (*Heracleum sphondylium*), cow's-allheal (*Stachy's palustris*), knap-weed (*centaurea nigra*); and among these weeds were thinly scattered the (*Holcus avenaceus*) tall oat-like soft grass, *Dactylis glomerata*, and *Agrostis vulgaris*. The neglect of foul hedges and road sides, is the best possible encouragement for the propagation of those perennial weeds which infest permanent pasture land. In Warwickshire, we have seen valuable pasture land so deteriorated by the intermixture of these weeds, supplied liberally from foul hedge-rows and road-sides, as to be little superior to the worst land, kept under proper management; besides, the weeds in these nurseries afford shelter, and, at particular

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seeds sown and harrowed in, without the use of the plough.* Light Fen soils may be successfully returned into permanent pasture, by this mode, after having been for some years in a course of tillage. The present practice is to lay down those lands into pasturage for a considerable term of years, varying in length according to local circumstances; but from observations made on the property of His Grace the Duke of Bedford, at Thorney, in the Isle of Ely, as well as by the result of one or two experiments which have been tried, it appears that the quality and duration of the herbage upon these Fens, may be very greatly improved by a more judicious and careful selection of seeds, with respect to the sorts of grasses to be sown, the cleanliness of the seeds, and the proportions to be observed in mixing the several quantities of each.

On flat lying land, partly alluvial and partly peaty, which had been supposed could never be returned to rich, valuable pasture, by art it has been effected in one season, on a farm of Emily, Marchioness of Londonderry, North Cray, Kent, and rendered equal to the richest natural meadows in the neighbourhood.

Of calcareous gravelly soils, that have been converted into rich productive permanent pasture in the short space of two seasons, may be mentioned that of Mr. Crawley's estate, at Stockwood, in the southern part of Bedfordshire.

Stiff clayey soils that for the most part are wholly incapable of being brought into a profitable state of pasture, may, by these seeds, and the aid of clean preparation, and judicious manuring, be covered with valuable permanent pasture, and made capable of carrying heavy crops, when once the proper Grasses are established. As an instance, we mention that of Mr. Whitehouse's, of Studley, Warwickshire, where an extensive field of the same description, in one season was formed into a nutritive productive pasture.

Light sandy and gravelly soils have, where these seeds were employed, with perfect success been turned to improved permanent pasture:—among which, occur those of Mr. Stansfield's, of Wakefield, Yorkshire; Mr. Beumont Swete's, Oxton, Exeter; Mr. Childer's, of Cantly, Yorkshire; the Duke of Bedford's, in Devonshire, under the direction of Mr. Wilson, Manor House, near Tavistock; on Speedwell farm, Woburn, Bedfordshire, under Mr. Todd; and at Cheynies, Buckinghamshire, directed by Mr. Tween.

On moor and gravelly soils, of high elevation, permanent pasture of superior quality has been formed and improved, where the new practice has been adopted, as on the estates of Mr. Brown, of Auchenlochan, Lismahagow, Lanarkshire; and Lord Ruthven, in Perthshire, and under circumstances extremely unpropitious, the season being hot and dry, and of course very injurious to the seedling grasses.

The above instances are selected, with the view of pointing out the invariable success of the practice, on soils of opposite natures; but equal in importance to the preparation of the soil, and of suiting the proportions of the different kinds of grasses to the nature of it, is the genuine quality of the seeds, for where they are not good, or only partially so, the result will be very unsatisfactory, if not altogether a failure.

* Mr. Bell, W. S. Queen-street, Edinburgh, laid down a large extent of this kind of soil, in this manner, without the aid of the plough, with these grass seeds. That Gentleman has published an account of the results, and states, that for four years these new pastures have been pastured with a full bite, from the middle of March to the 23rd of May, that 348 stones, of 22lbs., or 3 tons, 8 cwt., and 40lbs. of hay, per Scotch acre, have each year since sowing, been reaped in 43 days, and the meadows afterwards pastured till the end of November, thus giving 26 weeks pasture.

periods, nourishment to insects, which annoy and distress cattle in summer.*

The mode of returning tillage land into permanent pasture, called transplanting, was first practised by Mr. John Blomfield, of Warham, Norfolk, in 1812. It consists in transplanting pieces of turf three inches square or more. These species of turf are taken from a good sward, and planted on the land intended to be converted to pasture, at six inches apart; an acre of turf therefore, is estimated to plant nine acres of arable land. If the field from which the turf is to be taken to make the new pasture, is intended to be broken up for a course of tillage crops, then the whole of the turf may be pared off, and employed in forming the new pasture to the required extent. But should the field be required to remain in permanent pasture, a portion only of the turf must be taken from the field, and a sufficiency of the sward, or grass plants, left standing for that purpose. In the latter case, the turf is cut out in ribs by a paring plough six inches wide, leaving ribs of grass three inches wide uncut; the cut turf being removed, the plough, set at the same guage, is then drawn across the field, at right angles, to its former direction, and cross-cutting the uncut ribs of grass, will leave patches of grass three inches square in each angle. After the turf is removed the field should have a good top-dressing, not less than thirty or forty loads per acre, of compost manure or good vegetable mould.

In the operative part of transplanting turf, particular attention is required in carefully turning the flag with its grass side up, and in pressing the plants well into the ground; for if the roots of the plants are left exposed to the vicissitudes of winter weather, they will certainly be injured in a material degree. The whole process should therefore be effected with all possible expedition, particularly when carried on in winter; but which is not advisable, as frosts, more or less, are expected every night in that season: no more turf should be cut, carried, and spread in the day, than is likely to be planted before night.

No stock of any kind should be admitted upon the young pasture until after the grasses have perfected and shed their seed.

The expense of converting arable land into pasture by transplanting turf (according to the certificate delivered by Mr. Henry Blyth, of Burnham, as a claimant for the premium offered by T. W. Coke, Esq., 1816, for the encouragement of this new description of husbandry), is as follows:—

	A.	R.	P.
Extent of grass land pared to produce plants for transplanting, the turf being cleared off..........	1	2	18
Extent of arable land transplanted with the above....	11	0	15

EXPENSE.

	£	s.	d.
To ploughing or paring 1 acre, 2 roods and 18 poles, at 10s. per acre	0	16	1½
To carriage of 600 loads of turf, 50 days work for one horse, at 3s. per day	7	10	0
To lads driving carts—one boy 14 days, at 1s. 2d. per day, and one ditto at 10d. per day	0	19	8
Carried forward....	£9	5	9½

* Vide Hortus Gramineus Woburnensis, p. 219.

	£	s.	d.
Brought forward	9	5	9½
To scarifying 11 acres and 15 poles of ground, when covered with turfcut in pieces, at 2s.6d. per acre,	1	7	8¾
To labourers filling, cutting, spreading, and planting the turf on 11 acres and 15 poles of land, at 30s. per acre	16	12	9¾
	£27	6	4
Total expense per acre	2	9	2¼*

Mr. Blaike observes, that in the foregoing estimate there is no allowance made for the expences incurred by the clear out-summer fallow of the arable land, nor of the year's rent, poor's rates, and taxes for that year; neither is there any charge made for restoring the land to its previous state from whence the turf plants were taken: consequently there may be a very considerable additional charge made against the transplanted pasture. It is usual to sow a mixture of grass seeds among the transplanted turf.

It would appear that for very poor, thin, sandy soils, or their opposite extreme, tenacious clayey soils, where a proper tilth cannot be obtained for the grass seeds, the transplanting of rich turf already formed must be useful. By this mode, the valuable grasses, should the turf contain them, are not multiplied or increased in number, but are only removed from one spot to another; so far the practice may be said to be of a primitive nature.

The seeds of all the most valuable permanent pasture grasses may be introduced successfully into old pastures which are deficient of these valuable species, or which may have become coarse, and unproductive of nutritive herbage. The mode of renovating defective pastures of this nature is simple. Should the land require draining, this essential preparation should be effected in the first place. The sward or surface of the field should be subjected to double cross harrowings, so as to raise an appearance of tilth. After which rotten dung or finely divided compost of rotten dung, mould, decayed scourings of ditches, coal ashes, roads crapings, &c. whihc have been mixed together and several times turned over and incorporated during the space of six months or more previous to being used should then be liberally applied. The compost should be in a finely divided state, so as to unite intimately with the tilth produced by the harrows, and to insinuate itself through the herbage to the surface of the soil. This effects communication between the top-dressing and the original soil, by which means the roots of the seedling grasses in a great measure are established as soon as they vegetate. A mixture of the different gasses suited to the nature of the soil, and in quantity equal to the deficiencies of the pasture, should then be sown as before recommended for reconverting tillage land. The quantity of seed required for this purpose may vary from two to six pecks per acre, according to the state of the pasture, and the proportions of light or of heavy seeds required.

We may here mention one instance out of many, which might be adduced from our personal knowledge, to shew the perfect success of the practice of renovating defective meadows. An old meadow on a rich alluvial soil, situated in a low level where complete draining could be

* See Blaike's Treatise on Transplanting Turf, and Hort. Gram. Wob. p. 418.

with difficulty effected, had by mismanagement—successive hay crops, neglect of draining the top-dressings, and the occasional introduction of the seeds of the superior grasses—become extremely coarse and unproductive; the herbage consisting chiefly of different species of sedge (*Carex*), woolly soft grass (*Holcus lanatus*), tall oat-grass (*Holcus avenaceus*), narrow-leaved bent or water-grass (*Agrostis stolonifera var. angustifolia*), marsh crow foot (*Ranunculus palustris*), and bitter crow foot or butter-cups (*Ranunculus acris*). The meadow in this state came into the possession of the present worthy proprietor, Joseph Hardcastle, Esq. of Hatcham House, Surrey, who using the proper means, similar to those above recommended, introduced the meadow foxtail, meadow cat's-tail, cock's-foot, rough-stalked meadow grass, crested dog's-tail, sweet-scented vernal, meadow fescue, and perennial red clover, in the short space of two seasons, to the almost entire exclusion of the unprofitable herbage above described. This meadow from being one of the worst is now one of the most valuable in the same level.

An English garden lawn forms one of the most interesting features in British gardening in the estimation of foreigners. The grasses which exhibit the verdure and equal surface so much admired in the finest lawns are, the *Festuca duriuscula*, *Festuca ovina*, *Agrostis capillaris*, *Avena flavescens*, *Cynosurus cristatus*, *Poa pratensis*, *Lolium perenne*, *var. tenuifolia*, and *Trifolium minus*, with an occasional admixture of *Anthoxanthum odoratum*, *Agrostis vulgaris*, and *Trifolium repens*. To form a fine lawn, it is requisite to have the soil light, sandy, and free of stagnant moisture. The surface soil should be of as equal a quality as possible throughout; and consolidated by rolling before the seeds are sown. The greatest care is required in sowing and in covering the seeds, that every seed may be equi-distant from another throughout, and not sown or drawn by the rake or harrow into clumps or masses. Seeds sown in April will produce a beautiful lawn, hardly to be distinguished from the finest old grass plat, in two months. We may be permitted to mention one instance in illustration of the above fact. Jonathan Lucas, Esq. of New Cross, Surrey, having occasion to remodel his pleasure grounds and flower garden, decided on renewing the grass lawn by seeds of the proper lawn grasses rather than by turf, which always contains a smaller or greater proportion of broad-leaved plants, as daisies, dandelions, plantain, hawk-weed, sorrel, &c. which much detracts from the beauty of a garden lawn. Mr. Lucas prepared the soil for the reception of the lawn grass seeds in the best manner possible; by proper draining, where required, equalizing the nature of the surface of the soil throughout, consolidating it in such a manner by the roller, &c. so as to render inequalities unlikely to occur, under any ordinary circumstances of compression or consolidation of loose portions of newly removed earth. The tilth was made particularly fine, and a combination of the different species of grass seeds above mentioned, were sown with care, at the rate of four bushels and a half per acre. The seeds were sown in April, and the lawn in appearance was perfect in June following. In the succeeding spring the texture and general appearance of this lawn was not to be distinguished from those of a natural lawn of the finest quality, except that the verdure of the new lawn was of a deeper tint and more equal throughout the whole of its surface.

There are several species of our British grasses, whose culms or straw afford a material for the manufacture of straw bonnets, such as will equal if not surpass the finest Leghorn manufacture. As several of these species

of grasses affect soils of a different nature, it may be useful to mention the different soils peculiarly adapted to the growth of certain species, that those who may be locally circumstanced as to a particular soil, and who may be disposed to encourage the introduction of so valuable a manufacture among the females of the labouring classes, may be saved the temporary disappointment caused by cultivating a grass not adapted to the soil, or not calculated to afford the finest straw for the intention :—

HEATH, OR BLACK SILICEOUS MOOR SOIL.

Festuca ovina, Sheep's-fescue grass.—Straw very fine and clear.

Festuca duriuscula, Hard-fescue grass.—Straw long, equal, and clear, but coarser than the sheep's fescue.

Festuca ovina, hordeiformis, Long awned sheep's fescue.—Straw long, clear and equal.

Nardus stricta, Upright mat grass.—Straw long, without joints, very fine, equal, and tough; perhaps the best grass for the supply of straw for the Leghorn plait.

DRY SOILS.

Cynosurus cristatus, Crested dog's-tail grass.—Straw fine, strong, and tough; well adapted for the Leghorn plait, but the culms are frequently subject to discolouration, particularly after the time of flowering.

Poa angustifolia, Narrow-leaved meadow grass.—Straws very long, fine, and clear, greatly superior to the *Poa pratensis*, of which Miss Woodhouse's celebrated bonnet was made.

Hordeum pratense.—Straw of a good quality for the Leghorn plait, being fine, tough and clear.

Anthoxanthum odoratum, Sweet-scented vernal grass.—Straws clear and straight, but frequently rather coarse.

DAMP OR MOIST SOILS.

Agrostis canina fascicularis, Bundled-leaved brown bent.—Straw very fine and white, but not of great length.

Agrostis canina mutica.—Brown bent straw, longer than that of the preceding, in all other respects similar to it.

Agrostis stolonifera angustifolia, Narrow leaved stoloniferous bent,—Straw long, tough, and bleaches equally of a fine white.

Agrostis stricta, Upright bent.—Straw very fine, straight, and tough.

Of these the *Nardus stricta* is probably the best. The straws have only one joint, and are of nearly an equal thickness throughout the whole length. They are tough, and, for fineness surpass every other kind of straw. A bonnet made of these would supersede any imported from abroad, for fineness of texture, evenness of plait, and toughness of fibre. From various comparative trials to ascertain the best period for cutting the culms of the grasses for straw plait, the period of flowering proved the best. The straws may be bleached by placing them in a proper vessel, pouring boiling water upon them, suffering them to remain for one or two hours in this state; then spreading them out on a grass plat, moistening them with water as they become dry, and turning them once or twice a day for two days. There is little reason to doubt but that the manufacture of straw bonnets might be brought to a greater degree of perfection in England, with the material above mentioned, than it has yet arrived at in Italy, and that if properly encouraged, Britain, instead of importing would export the finest manufacture.*

[In conducting to advantage the application of grass seeds, it is of the greatest possible importance to select such as are genuine; and, we can say, from our personal knowledge of the practical talent of Mr. Sinclair, and the respectability of the firm with which he is connected, that there is no establishment in England, where these can be purchased to such advantage, as they can at Messrs. Cormack, Son, and Sinclair, *New Cross, Surrey*, and as we can have no interest further than the interest which we feel from the improvements in agriculture, we cordially recommend this Seed Establishment to farmers generally.—Ed.]

* Hort. Gram. Wob. p. 428.

HAWTHORN.—*See* THORN.

HEDGES.

The hawthorn, on account of the stiffness of its branches, the sharpness of its thorns, and its capability of bearing the severest winters without injury, is universally preferred to all other trees for hedges, and may be so managed as to present a barrier to all kinds of cattle, and not without difficulty to be passed even by such disorderly persons as might attempt to intrude upon the grounds of others. Though with a comparatively small expence fences both durable and elegant might be constructed, yet how few fields, and still fewer plantations, do we pass without seeing them exposed to the ravages of all kinds of cattle; a mock ditch, a ragged and rotten hedge, or a broken wall, being in too many instances the only barrier to defend valuable property from the inroads of every browsing animal. The common practice of making hawthorn hedges is to plant the young trees in a straight line, from four to six inches apart, either upon an embankment or on the level surface, according to the wetness or dryness of the soil. In pruning it is usual to head them back three or four times before they are suffered to throw out for good, the first cutting being made almost close to the ground, and each succeeding one about six or eight inches from the last, in order to make them thick at bottom. After this they are regularly cut twice a year with a switching bill, to what is called a "*hog-mane*," being narrow at the top and sloping gradually at the sides. A new and improved method, however, obtains in the best hedge districts, which we shall now briefly notice under the following heads:

1. *Preparation for Planting.*

This consists in constructing a suitable bank for the reception of the plants. The direct line of hedge being stumped out in the usual manner, the bank is commenced by ditching and forming the bank with the excavated earth. The embankment, however, should be so constructed that the plants, when placed upon it, have a slight inclination upward. A sod of earth five or six inches thick, and somewhat broader than the spade, should then be raised and inverted, or laid over grass to grass, along the edge of the marked line, which when neatly pared and beat down with the back of the spade, forms as it were an inclined plane, upon which the plants are to be placed.

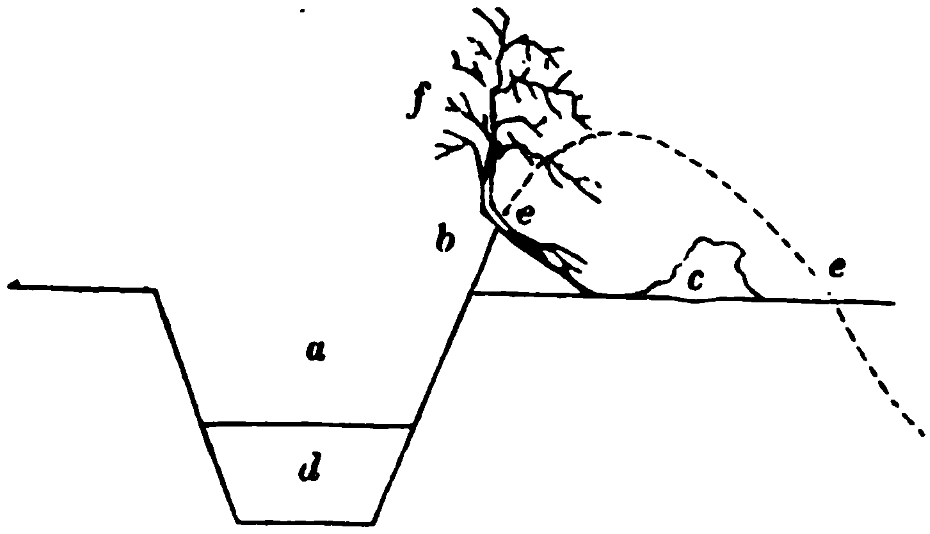
2. *Preparing the Plants.*

In making a choice of plants, a good fibrous root and a clear stem are essentially necessary for a quick growth, and if possible, those two years transplanted into nursery lines should be preferred. Previous to planting, the top of the stem should be cut off with a sharp knife about five or six inches above the roots, giving the cut an inclination upwards. A more expeditious way of preparing the plants, is to take a handful evenly together, and laying them upon a block cut them off with a sharp axe. It is of importance, however, that the cut should be clean and smooth; the former method, though the most tedious, should therefore be preferred. The long part of the tap-root, as likewise any diseased or decayed fibres should also be removed. The plants if cut in frosty weather, should, immediately after the operation, be covered with earth, and planting in the afternoon when it is likely to be frosty should be carefully avoided, as there will be probably not time to cover the plants with a sufficient quantity of earth to resist the effects of a frosty night; indeed, in such weather, it is much the best way to defer the business altogether. On the other hand, if the planting be commenced in spring, and the hedge is to be laid upon dry land, the plants after they have been cut should be placed in a puddle of earth and water in a shady place till wanted, for by so doing their vegetative powers will be greatly accelerated.

3. *Planting.*

When the plants are quite ready they may then be placed upon the bank, so that the point where they are cut may be about an inch beyond the sod towards the ditch. The annexed vertical figure will convey an accurate idea of the method of planting:—

—*a*, represents the ditch; *b*, the laid plant upon the inverted sod; *c*, the turfy mould thrown off the surface of the ditch. The plants being placed from four to six inches apart, they sho ld be covered as speedily as possible with a portion of the best mould from the



ditch. The remainder of the earth (*d*) is then to be thrown up, and laid in a neat ridge sloping gradually backwards from the plants; the richest portionof the mould being placed at the back beyond its roots. The top being slightly flatted and the sides properly smoothed finishes the process of planting, and the embankment above the plants will then appear as *e e* in the figure. The ditch should be equally sloped on both sides to the proposed depth, keeping it one foot wide at bottom, whatever be the size of the ditch. Fig. *f* represents the tree in its growth.

4. *Pruning and after management.*

The after management consists in weeding, clearing, loosening and laying new earth to the roots for the first three or four years. With respect to the trimming or pruning, it should be done with the greatest carefulness and nicety, as upon this the beauty and future value of the trees very much depend. The proper time for this operation is either late in autumn, very early in spring, or about midsummer, and not as in many instances late in the spring season when the sap is flowing; the check and injury the plants must necessarily receive from such an improper practice may be easily conceived. All straggling branches growing over the ditch may be switched off, leaving those behind towards the bank untouched. A hedge however will hardly be found to require much pruning the first year; but should any branches grow so luxuriantly as to overtop their neighbours, they should be switched off to a uniform height. In trimming it is the practice with some to use shears but the *switching bill* is undoubtedly the best instrument for the purpose; it resembles a large pruning knife, with a handle from two to four feet in length, and is universally employed in the best hedge districts.

HEMP.

Hemp (*Cánnabis satíva*), Diœ'cia Pentándria, Linn; and Urtíceæ, Juss.

By far the greater portion of hemp employed in this country is exported, and our government, aware of its many important uses, have made several salutary laws to render its culture an object of attention. In the year 1787, a bounty of three-pence per stone was allowed on all hemp raised in England, and duties have been laid on all that is imported. In strength the English hemp is deemed much superior to that grown in any other country.

Culture, &c.

SOIL.

A sandy loam containing black putrid vegetable earth, or old meadow lands, seem most congenial to the hemp.

PROPAGATED.

1. *By seed.*—The preparation of the soil for the reception of the seed is the same as for flax.—(*Vide* flax.)

2. *Time of sowing* from the middle of April until the beginning of May.

3. *The quantity of seed*, will, of course, vary with the *quality* of the soil, but from two to three bushels per acre is quite sufficient, and which, in accordance to univeral custom, should be sown broad-cast.

PLANT.

1. In the subsequent culture, little requires to be done except in preserving the seed

from the attack of birds, and where necessary supporting the crop by lines or cross roads in the case of flax.

2. In taking the crop two modes are employed, according to the objects inview; when grown entirely for the fibre it is pulled when in blossom, without reference either to the male or female plants, but as it is usually grown both for the fibre and seed, the common practice is to pull up the male plants (which blossom four or five weeks earlier than the female plants) as soon as the flowers begin to fade, the stalks at this period being easily recognised by their yellowish cast. They are tied in small bundles, and immediately carried to the watering pools, as in the manner of flax. The operation of pulling the females commences when the seed is ripe, which is known by the brownish or greyish hue of the capsules, and fading of the leaves. The stalks are then pulled and bound up into bundles, being set up in the same manner as grain, until the seed become so dry and firm, as to shed freely; great care should be taken at pulling, not to shake the stalks rashly, otherwise, much of the seed may be lost. It is advised, that after pulling the seed, hemp may be set to stand in shocks of five sheaves to dry the seed; but in order to prevent any delay in watering, the seed pods may be cut off with a chopping knife, and dried on canvass, exposed to the air under some shed or cover. This method of drying the seed will prove of great advantage to the hemp, as the seed and pods, when green are of such a gummy nature, that the stems might suffer much by sun burning or rain, which will discolour and injure the plant before the seed can be sufficiently dried upon the stalks. Besides, the thrashing out the seed would damage the hemp in a considerable degree.

3. Hemp is *watered*, *bleached*, and *grassed* in the same manner as flax. Grassing is omitted in some places, and drying substituted; in other districts watering is omitted with the female crop, which is dried and stacked, and dewed or bleached the following spring. On the Continent, hot water and green soap has been tried, and here, as in the case of flax, it is found that steeping two hours in this mixture, is as effectual in separating the fibre from the woody matter, as watering and grassing for weeks.

USE.

1. The hemp is a plant of great importance to Britons, as it forms the sails and tackle of our vessels, from the huge cable of a ship of war, to the more humble but not less profitable net of the herring boat.

2. Exceeding good huckaback is made from it for towels and common table cloths. Husbandmen, servants, and labouring men, prefer hempen cloth to Irish or other linen, being stronger and warmer, becoming at the same time whiter by age and use. English hemp, properly manufactured, stands unrivalled in its strength, and is vastly superior in this respect to the Russian.

3. An oil is obtained from the seeds by expression, which forms an article of diet in Russia, and is frequently employed by artists and painters in this country.

4. The seeds are sometimes given to poultry, and is supposed to occasion hens to lay a larger quantity of eggs. Small birds are very fond of them, but they should be given with caution, and mixed with other seed; when given to goldfinches and bullfinches in too large quantities, it is asserted that it changes their red and yellow plumage to perfect blackness.

5. In speaking of the virtues of this plant, Coles, in his History of Plants, laconically remarks, "By this cordage ships are guided, bells are rung, beds are corded, and rogues are kept in awe."

HERBS.

The propagation and cultivation of the various sweet and savoury herbs, are given under their respective names in the alphabetical arrangement, but as it is very important to those who are not in the constant habit of attending the markets, to know when the various seasons commence for purchasing *sweet herbs*, and also the best means of preserving them, we subjoin the following excellent instructions by Mr. Butler, Herbalist, Covent-Garden Market.

"All vegetables are in the highest state of perfection, and fullest of juice and flavour, just before they begin to flower; the first and last crop have neither the fine flavour nor the perfume of those which are gathered in the height of the season; that is, when the greater part of the crops of each species is ripe. Take care that they are gathered on a dry day, by which means they will have a better colour when dry. Cleanse your herbs well from dirt and dust; this is sadly neglected by those who dry herbs for sale. If you buy them ready dried, before you pound them, cleanse them from dirt and dust by stripping the leaves from the stalks, and rub them between your hands over a hair sieve. Put them into a sieve and shake them well, and the dust will go through. Cut off the roots, separate the bunches into smaller ones, and dry them by the heat of a stove or in a dutch-oven, before a common fire, in such quantities at

a time, that the process may be speedily finished, *i. e.* "kill 'em quick," says a great botanist, by this means their flavour will be best preserved. There can be no doubt of the propriety of drying herbs, &c. hastily, by the aid of artificial heat, rather than by the heat of the sun. In the application of artificial heat, the only caution requisite is, to avoid burning; and, of this a sufficient test is afforded by the preservation of the colour. The common custom is, when they are perfectly dried, to put them in bags, and lay them in a dry place; but the best way to preserve the flavour of aromatic plants, is to pick off the leaves as soon as they are dried, and to pound them and put them through a hair sieve, and keep them in well stopped bottles.

The following table will point out the best periods for collecting and preserving them:

Name.	Period for Drying.	Name.	Period for Drying.
Basil	From the middle of Aug. to the beginning of June	Sage	August, September
Elder flowers....	May, June, July	Savory (Summer)	Latter end of July and throughout August.
Fennel	May, June, July	Savory (Winter)	Latter end of July, August
Mint	Latter end of June & July	Tarragon	June, July, August
Marjoram knotted	From the begin. of July to the end of summer	Thyme (com.)	During June and July
Parsley	May, June, July	Thyme (orange and lemon)	During June and July

Dr. Kitchener's Cook's Oracle.

HOLLY.

Holly (*I'lex aquifólium*), Tetrándria Tetragy'nia, Linn.; and Rhámni, Juss.

This is a handsome evergreen tree, rising from twenty to thirty feet high, of slow growth, but affording timber of considerable value; numerous variegated varieties, to the number of forty, are kept in gardens for ornamental purposes.

Culture, &c.

SOIL.

A free deep loam, or a soil of a light sandy nature, is best suited to this tree. It will flourish in almost any situation, but more particularly upon dry hills, in hedges, and in bushy places.

PROPAGATED.

1. *By seed,* which should be gathered in November, for if snow come, there will be scarcely a berry found upon the trees, being carried away by the birds; for it is a fact that birds will fall upon these when nothing else can be procured.

2. The berries should, as soon as collected, be mixed with sand in the proportion of three measures of sand to one of berries, and suffered to remain in the sand for one or two years in some damp situation as in a shed or cellar. To secure their speedy vegetation when sown, it is generally requisite to let them remain for two years; but as some of them will vegetate the second year, it is considered a good practice to sow them after one year's rotting; when sown, they will continue to come up for two seasons, and probably a few will not spring until the third. The same precautions should be used in preparing the ground, in forming the beds and covering the seeds, as recommended for the Thorn. The seed beds should be formed and the seed sown in September or October, but certainly not later than November; at which period, if the ground should be in a very damp state, it will be much better to defer the sowing until the month of February.

3. All the varieties are increased by budding and grafting them upon the common sorts.

TREE.

1. Hollies which have stood two years in the seed bed, should, in the month of April, be planted out into nursery beds at five or six inches apart, there to remain for two years

longer, when they are to be lifted and planted out into nursery lines, to stand for two years or more. For which purpose a piece of the richest light land should be chosen, and if possible a damp day, planting them fifteen inches between the lines, and eight inches in the lines, which will be room sufficient.

2. In transplanting them from the nursery lines into hedges, fences, &c. the greatest care is necessary; indeed the same may be said of all evergreens, for they all transplant with much more risk than deciduous trees. It is therefore necessary to pay particular attention in preserving the adhering earth at the roots when lifted from the nursery ground, and as it is highly improper to have their roots exposed in dry weather, it is advisable to delay lifting them if possible till damp weather.

USE.

1. The wood of the holly is very hard, close, and fine grained, and is very valuable when of considerable size. It is used for veneering, and making of Tunbridge-ware, is sometimes stained black to imitate ebony, and is found to take a very brilliant polish.

2. The long and straight branches are used for whip handles and walking sticks, being very tough in their young state.

3. Holly plants for the purpose of making hedges, should be planted as such when they have been nursed for two years, from the transplanted beds, that is, when they are four years old. In planting them they should stand at the distance of nine or ten inches apart; and if protected for the first five or six years, will soon after that, under good management, defend themselves from all attacks and make excellent fences, affording shelter as well as a boundary, either to fields or plantations.

4. A curious physiological fact has been often noticed by botanists in regard to this tree, which is, that it is furnished with prickly leaves near the ground, and entirely smooth ones towards the top, when growing in situations which render it liable to the attacks of deer or other animals.

5. The brush makes good dead hedges, in which it will lie with its leaves not perished for three or four years; and the branches being generally laden with berries about the time of Christmas, are employed in decorating rustic kitchens and churches.

6. The bark, abounding with mucilage, is used for making bird-lime, by maceration in water.

HOP.

Hop (*Húmulis Lúpulus*), Di'œcia Pentándria, Linn.; and Urtíceæ, Juss.

The hop is a diœcious plant, *i.e.* bearing its flowers on different individuals, and as these are the parts in request, the female plant only is cultivated; its varieties are numerous. The following are generally cultivated in Kent.

1. Goldings—grown on the lime-stone rock of middle Kent.
2. Canterbury Grape—on the same, or subsoil of chalk.
3. Mayfield Grape—on all good and dry soils.

The Farnham and Canterbury white bines, and the Goldings, excel all others in quality and flavour.

Culture, &c.

SOIL.

A fresh rich dark loamy soil with a dry bottom, seems best adapted for the growth of the hop. On stale arable lands it seldom succeeds.

PROPAGATED.

1. By cuttings or sets, which are taken from the old stools at the time of pruning, they are generally about six inches in length, having two or three joints or eyes to each; these are sometimes bedded or planted in nursery beds, for one year, or otherwise planted at once where they are to remain.

2. The season for planting the cuttings, is from the middle of February to about the 25th of March, but the sets that have been bedded, may be planted either in November or in February or March; the former require five or six, the latter three or four sets, to form a hill.

The cuttings should be inserted about five inches in the earth, at equal distances, in a circle of five to six inches in diameter. Bedded sets require a hole dug to the depth of twelve or fifteen inches, which is usually filled with well-rotted manure or a rich compost prepared for the purpose.

3. Hops are generally planted in rows eight or nine feet distant, the hills from three feet to three feet and a half apart, or otherwise in parrallel or triangular rows, from six to seven feet asunder.

4. Previous to the time of planting the ground must be well manured, trenched, or ploughed as deep as the soil will admit. The after culture, during the first year, consists in frequent horse and hand-hoeing, by which means the land is always kept clear of weeds. The practice during the subsequent years, varies according to the nature of the soil and the peculiar ideas of the cultivator; some plough the alleys and dig the slips, others dig all the land in winter, whilst a few dig the whole twice a year: care, however, in every case must be taken not to disturb the roots of the plants unnecessarily during their early growth. In *March* the hills are cleared of weeds and the old bine carefully removed, fine earth is drawn over each hill, and every crown is covered with rich mould to the depth of one inch, or one inch and a half. In April the poles are set, two, three, or four to each hill, generally three; the poles are usually from twelve to eighteen feet in length, and in Kent those obtained from the ash, chesnut, maple, and willow, are preferred. From 3000 to 4800 poles per acre are usually required.

5. As soon as the young bines reach the poles they are tied two or three to each pole with soft rushes, the operation being performed by women. Each hill is now carefully dug, and it is a practice with some planters to remove a certain portion of earth from each hill, filling up the cavity with rich manure, and then covering it over by replacing the mould. Early in June the hills are cleared of all superfluous bine, and two or three shovels full of fine earth put round the plants, after this period the ground requires frequent hoeing; but at Midsummer the fibres of the root spread themselves so near the surface that care must be taken not to move the earth too deeply, or the delicate fibres will be torn asunder, and the future growth of the plant materially injured.

6. As soon as the hops are ripe, which is generally in September, the bines are cut, and the poles drawn from the ground and laid on bins or baskets prepared for the purpose. The gathering of the flowers is the next process, in which men, women, and children, are equally engaged; an active person may gather from ten to thirty bushels per day; the price for "picking" necessarily varies with the nature and productiveness of the crop, generally from four to eleven bushels for one shilling is the average price.

7. The hops are next laid on hair cloth, tiles, or union plates, and carefully dried by a current of warm air produced by fires made of charcoal, coke, or Welsh coal; as soon as they are sufficiently cooled so as not to break in pieces, they are carefully packed in bags, each bag containing about five yards of coarse cloth, from forty-two to forty-five inches in width, and must weigh 2 cwt. 2 qrs. and by law not more than 1 lb. of cloth must be used for 10 lb. of hops; the bag when filled, usually weighs from 2 cwt. 2 qrs. 7 lbs. to 2 cwt. 2 qrs. 14 lbs. A pocket weighs about 1 cwt. 2 qrs. 14 lbs. and from 60 to 80 bushels by measure are required for every cwt. of hops. For the *above* details we are

indebted to one of the most eminent hop planters in Kent—for the following we are indebted to an old and experienced hop planter at Farnham.

Farnham Hops.—"There are several varieties of the hop grown in this neighbourhood but the best, and that which is most cultivated, is the white-bine grape; it is found to be the most profitable upon all good lands, and is much esteemed for being a close hardy hop, less liable to blight than any other variety, more full of condition, and of a pleasant, delicate bitter taste.

The kind of plant cultivated, constitutes the essential difference between the Farnham and Kent hop, the blossom of the former being paler than that of the latter, which makes it necessary in the process of drying the Kent hop, to use sulphur, in order to give that paleness of colour so much in request; whereas the Farnham hop, being for the most part naturally pale, is dried with charcoal only, or a slight intermixture of Welsh coals.

The reason why the Farnham species are not generally grown in Kent is, that they do not thrive so well on the soil of that county. The hops are also sorted into classes, and great attention paid in cleaning them, and they are usually picked before they are over ripe.

The hop land here is seldom cultivated by horse implements, but is mostly effected by manual labour, by means of the spud and spud-hoe.

These plants are manured every year with dung, hair, rags, wool-clippings, or lime, but good dung is preferred to every other kind of manure, about 12 loads per acre, are usually employed, and the average yearly expense is about 40*l.* per acre, including every expense.

They generally tie three bines to a pole; the supernumerary branches and runners are cut off in the spring, and harvested after the manner of hay, being stacked for winter fodder for cows, which are very fond of them, and give good milk from this food. Twenty-four cwt. per acre have been grown on the very best land, in a remarkably favourable season; but on land of a middling quality, about 6 cwt. per acre, may be obtained. The price of hops of course varies as much as the produce, but Farnham hops generally fetch more than those of other districts. The great mart for this hop, is Wey-hill fair, where certain proprietors have a piece of land, called Blissimere Hall Acre, and on this, Farnham hops only are deposited for sale. These are chiefly bought by dealers from the West of England, who retail them to private families, by whom they are preferred on account of their colour, and the particular flavour which they give to malt liquor. Every pocket is stamped with a particular device, which is changed every year, and the growers bind themselves under a severe penalty not to put any hops but what are grown in that parish, in the pockets thus marked."

Insects and Diseases.—The hop is peculiarly liable to diseases. In its young state it is attacked by fleas of different kinds; as it advances in growth the green fly and red spider commit extensive ravages, and even its roots are frequently attacked by the larvæ of an insect called the otter moth. The honey-dew is very serious in its consequences:—"It appears to us," says Mr. Rennie, "that there can be little doubt that the sweet syrupy coating, called honey dew, is nothing more than the excrement of the insect (*Aphis humuli*) or hop fly." This seems very probable, as by means of a powerful lens, Mr. Rennie has actually seen the aphides ejecting the honey-dew. The almost instantaneous appearance of the hop-fly and the honey-dew, has given rise to the popular notion of their being brought by the winds, hence called "blights," but these prejudices are completely exploded by Mr. Rennie, in his valuable and interesting contribution on Insects.—*Vide* Insects.

USE.

1. The hop is cultivated almost exclusively for the brewer, its aroma and bitterness imparting that peculiarity of flavour so characteristic of good beer; at the same time it counteracts the acetous fermentation, and thus prevents it from becoming sour.

2. The young tender shoots are sometimes eaten in the spring, and are said to be but little inferior to asparagus.

3. The stalk and leaves dye wool of a yellow colour.

4. The hop is a useful narcotic, and the smell of its flowers soporific; hence a pillow stuffed with hops is an old and popular remedy for easing pain and procuring sleep. Such a pillow was employed by George the Third during his indisposition in 1787, and it is said to have produced refreshing sleep where opiates failed in affording relief.

HORSE.

The beauty of this animal has been the theme of both ancient, as well as modern poets, and his valuable services for domestic purposes, seem to have been in former days, nearly as much appreciated as at present. Among all quadrupeds which the art of man has rendered subservient to his uses, there is none which rank so high in value as the horse, and none which has engaged more general attention. From the noble-

man, the owner of a stud, down to the very helper of the stables, this beautiful creature is the object of admiration; and although every one is constantly in conversation, attempting to display his knowledge and judgment of its qualifications, yet few indeed ever form correct principles; which at once shews the necessity for a more intimate knowledge of the subject than is usually acquired by superficial observers.

Although the history of the horse affords great interest to the general reader, and the enumeration of the anecdotes relating to the great courage which is evinced by him in the field, the fleetness in the chase, the strength and muscular power in draught, and the other services which he renders to mankind in the vocations of social life, are particularly amusing; yet to appropriate any space to these, would occupy that which must be devoted to the relation of more useful facts.

The observations which we are about to offer will therefore be most conveniently arranged under the following heads:—

1. Anatomy of the horse.
2. A Description of the varieties in general use.
3. Breeding, rearing, and training.
4. Diseases of the horse.

Of the Skeleton.

The skeleton is the simple, jointed, bony frame, divested of the soft parts and dried. There are two kinds:—

1. *The natural skeleton* is that in which the bones remain attached to each other by their natural connections, denominated *ligaments*.

2. *The artificial skeleton* is made by separating the bones from all their natural connections, by macerating or boiling, and afterwards joining them again in their natural order and relative position, by wire or other means, so as to imitate as nealy as possible the former one; over which it possesses the advantages of cleanliness, distinctiveness, and more or less artificial mobility of the joints.

Construction.—Leaving the head and neck out of consideration, the entire frame will be found to come with sufficient proximity within the limits of a square, formed by drawing perpendiculars touching the extreme parts before and behind, from a horizontal line, level with the surface of the ground, to another parallel to it, touching the summits of the back. A line extending perpendicularly through the middle of the square, divides the frame into two nearly equal parts, and falls upon the ground, (represented by the inferior horizontal line) equidistant from the four points of tread; a line drawn in the horizontal direction through its middle, includes the trunk within the upper division of the square, the space formed by the limbs, as well as the limbs themselves, within the lower section. The limbs represent four columns supporting the body, the bones composing which, though many of them are obliquely placed, are found, on taking the aggregate of their directions, to maintain their bearing in lines parallel to the common centre of gravity, which may be said to be represented by the perpendicular line extending through the middle of the square. The angular position of these bones renders their motions more extensive and facile, at the same time that they, so placed, present convenient and powerful levers for the operation of the muscles. Furthermore the bones forming the limbs are superiorly lengthy, and few in number, whereas below the fetlock, they are small and consist of several pieces; the rationale of which is, that the long bones are well adapted for extent of motion, the short ones for resistance and multiplicity of movements. The head and neck operate as a burden in addition to half of the trunk, upon the fore-limbs; although the hind-limbs appear the greatest and most capable of resistance: this apparent incongruity is removed when we come to learn that the latter constitute the powerful engines of progression.

Of the multiplicity and variety of pieces, or distinct bones of which the skeleton is composed, most are found to be double, or to exist in pairs; such are the ribs, most of the bones of the head, and all those of the limbs: there are, however, several single bones; and these may be regarded as the key-stones of the fabric, being, in reality, the media through which the two lateral halves of the skeleton (composed of the bones in pairs) are united together into one entire structure. In this arrangement the symmetry of the whole is preserved most completely, even as completely as if every bone had had a fellow, since both sides of the single bones exactly correspond,

The bones so far influence and determine the form of the soft parts, that in very many (perhaps the majority) of instances, the animal is recognised in the appearance of the skeleton; in other examples, however, this is not so remarkable; in all, the resemblance can be traced only in certain parts. In general the head, chest, and legs—below the knees and

hocks, present striking outlines of the same parts in the living animal; whereas the neck, loins, arms, and haunches, have few or no points of similitude.

Division.—The *skeleton* is composed of 238 bones, and is divided into *trunk, head,* and *extremities.*

The Trunk is subdivided into spine, thorax, and pelvis.

The Head comprises the cranium and the face.

The Extremities are four in number: two fore and two hind.

TABULAR ENUMERATION OF THE BONES.

TRUNK.

SPINE.	
Cervical Vertebræ	7
Dorsal Vertebræ	18
Lumbar Vertebræ	5
Total	30

THORAX.	
Sternum	1
Ribs, 18 on each side	36
Total	37

PELVIS.	
Ossa Innominata	2
Sacrum	1
Coccygeal Bones, varying from 13 to 18	15
Total	18

HEAD.

CRANIUM.		
Frontal Bone		1
Parietal Bones—*pair*		2
Occipital Bone		1
Temporal Bones—*two pairs*		4
Ethmoidal Bone		1
Sphenoidal Bone		1
		10
Bones of the Ear.	Malleus, Incus, Stapes, Obiculare	4
	Total	14

FACE.			
Upper Jaw.	Nasal Bones	Pairs	16
	Superior Maxillary Bones		
	Inferior Maxillary Bones		
	Malar Bones		
	Lachrymal Bones		
	Palatine Bones		
	Superior Turbinated Bones		
	Inferior Turbinated Bones		
	Vomer—*single*		1
	Lower Jaw		1
			18
	Teeth		40
	Os Hyoides		1
		Total	59

EXTREMITIES.

FORE.			
Scapula, Humerus	*Shoulder Bones*		2
Radius, Ulna	*Arm Bones*		2
Bones of the Knee.			
1st. Row: Scaphoid, Lunar, Cuneiform, Trapezeum	2nd. Row: Pisiform, Trapezoid, Os Magnum, Unciform		8
Large Metacarpal Bone, Two Small Metacarpal Bones	Leg Bones.		3
Sesamoid Bones—*Fetlock*			2
Pastern Bone			1
Coronet Bone			1
Coffin, Navicular	*Foot Bones*		2
		Total	21

HIND.		
Femur—*Haunch Bone*		1
Patella—*Stifle Bone*		1
Tibia, Fibula	*Thigh Bones*	2
Astragalus, Os calcis, Cuboid Bone, Three Cuneiform Bones	*Hock Bones*	6
The bones below the hock correspond in name and number to those below the knee, *viz.*		9
	Total	19

The bones constitute the basis or fabric of the whole animal machine; these are so many levers acted upon by muscles and tendons so admirably arranged as to accomplish in the most effective manner, all those important purposes for which the horse is so truly valuable.

In treating of the muscular system of the horse, we shall chiefly advert to those points of structure and established principles, on which his usefulness and beauty so materially depend.

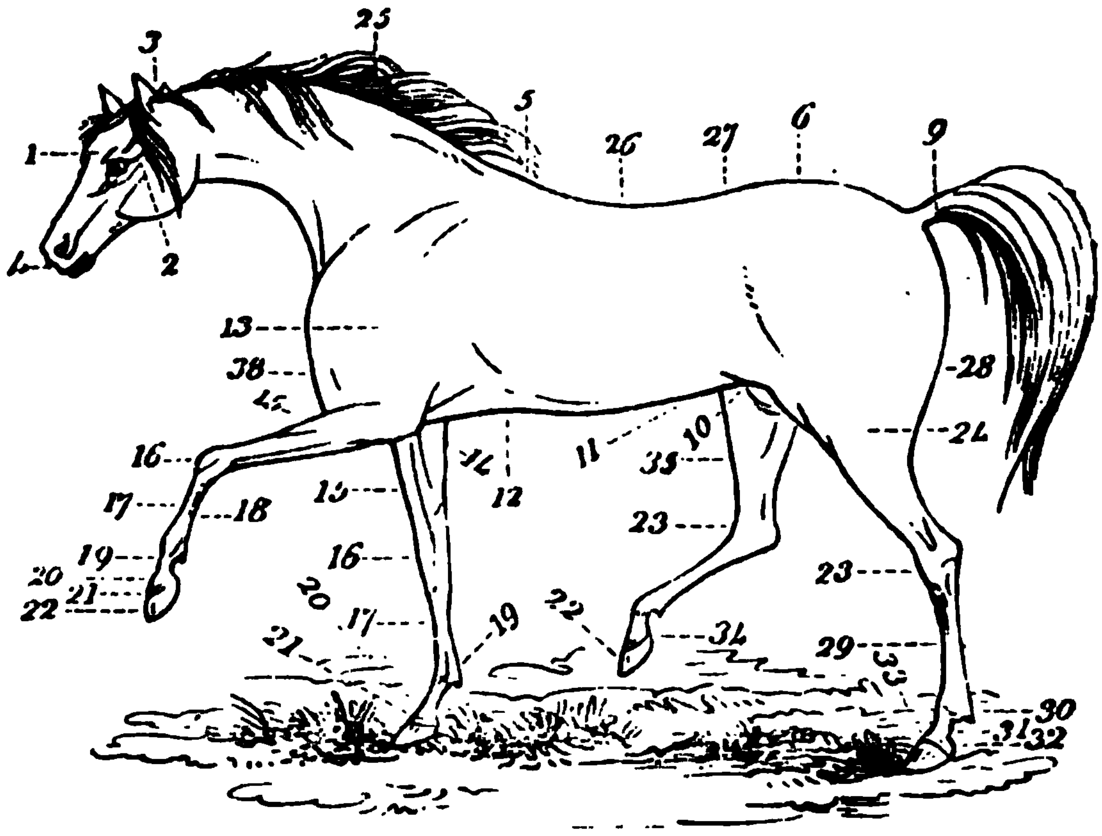


Fig. 1. The forehead. Few things more clearly indicate the blood of the horse than the forehead. In the blood horse the forehead is broad and angular, gradually tapering from this point to the muzzle, whilst in the cart horse the face is large, and the forehead narrow in comparison with that of the blood horse.

Fig. 2. The eye-pit. By the depth of the eye-pit we are enabled to form some idea of the age of the horse; at the posterior part of the eye a considerable quantity of fatty substance is deposited, which enables it to revolve in its orbit with facility and freedom, in old age and in diseases attended with general loss of condition, much of this fatty substance disappears, the eye becomes sunken and the pit above the eye deepens. To obviate this appearance, some of the lower class of horse-dealers puncture the skin, and by means of a quill or tobacco pipe blow into the orifice, and thus fill up the depression. This operation is called "puffing the glims," and may be easily detected by the application of pressure.

Fig. 3. The poll.

Fig. 4. The muzzle. The muzzle includes the lips, mouth, and nostrils. The darker the colour of the muzzle, the more is the horse esteemed. The lips should be thin and firm; in old and sluggish horses they are usually loose and pendulous.

Fig. 5. The Withers. The speed and action of the horse is intimately connected with the length and height of the withers, and such a development is absolutely necessary in the hunter, the hackney, and the farmer's horse; but, in the heavy cart horse, this rule may be reversed, as the more bulky and weighty he is before, the more advantageously will his powers be applied.

Fig. 6. The croup. The croup, which extends from the loins to the setting on of the tail, should be long, and but slightly rounded.

Fig. 9. The dock.

Fig. 10. The sheath.

Fig. 11. The flank. The space contained between the ribs and haunches, is called the flank; when too extensive it is an indication of weakness. The flank is usually referred to as indicating the state of respiration—during fever and chronic diseases of the lungs, it rises and falls with a rapidity greater than under ordinary circumstances.

Fig. 12. The girth or brisket.

Fig. 13. The shoulder. A muscular and slanting shoulder is indispensable where action and speed are required; but an upright shoulder may be preferable for horses exclusively destined for the collar.

Fig. 14. The elbow. Good judges prefer a deep elbow, as it is always connected with increased power of action.

Figs. 15-15. The Arms. On all hands it is agreed that the arms should be long, large, and muscular; if they are flat on the sides, and narrow in front as they approximate the shoulders, and deficient in muscle, they are radically defective, and the horse with such defects should of course be rejected.

Fig. 16. The knee. The knee should be broad, as offering more space for the attachment of muscles—breadth in this part being an indication of strength.

Figs. 17-29. The cannon or shank. The cannon should appear wide when viewed laterally, and thin in front, as any addition besides bone and tendon, must arise from disease or useless cellular matter.

Fig. 18. Back sinews. The back sinews should be large, firm, and distinctly felt from the knee to the fetlock. If there be any thickness of cellular matter around them, it indicates previous injury, as a rupture of the ligamentous fibres, and as this

thickening may limit the motion of the tendon, and predispose the part to a recurrence of lameness and inflammation, such a horse, although perfectly free from lameness at the time of examination, should be regarded with suspicion, and rejected as unsound.

Figs. 19-30. The fetlock joint. It is usual to apply the term fetlock to the joint itself, and the space between the fetlock and the foot, the pastern, but, properly speaking, the fetlock, or *footlock*, is only the posterior part of the joint, from whence grows a lock or portion of hair.

Figs. 20-31. The pastern. The pasterns should be neither too long or too short; if too short they are inelastic, and such horses are uneasy goers, and unsafe to ride: on the contrary; if they are too long, they are frequently too oblique and although from their elasticity, the motion of the horse may be pleasant to the rider, yet an increased length of limb is an indication of weakness.

Figs. 21-32. The coffin joint.

Figs. 22-33. The hoof.

Fig. 23 The hock. The hock is the most important and complicated joint of the whole animal, like the knee it should be hard and extended.

Fig. 24. The haunch.

Fig. 25. The neck. A moderate and elegant curve of the neck adds greatly to the beauty of the horse. This form is sometimes recurved, and the neck is hollowed inwards,—a horse with such a conformation, is called ewe-necked.

Fig. 26. The back. The comparative advantage of a long or short back depends entirely on the use for which the horse is intended. For general purposes, says Youatt, a horse with a short carcase is very properly preferred. He will possess health and strength, for horses of this kind are proverbially strong. He will have sufficient ease not to fatigue the rider, and speed for every ordinary purpose. Length of back will always be desirable when there is more than usual substance generally, and particularly when the loins are wide and the muscles of the loins large and swelling. The two requisites, strength and speed, would then probably be united. The back should be depressed a little immediately behind the withers, and then continue in an almost straight line to the loins. This is the form most consistent with beauty and strength. Some horses have a considerable hollow behind the withers; these are called *saddle backed*: a few have the curve outwards, and are called *roach backed*. This is a very serious defect, altogether incompatible with beauty, and materially diminishing the usefulness of the animal.

Fig. 27. The loins. The loins can scarcely be too broad and muscular; the strength of the back and hinder extremities hinge upon this point. At the union of the back with the loins, a slight depression is sometimes observable,—this must always be regarded as an indication of weakness.

Fig. 28. The hind quarter.

Fig. 35. The inside of the thigh or stifle.

Fig. 38. The point of the shoulder.

2. *Description of the Varieties of the Horse in general use.*

THE RACE HORSE.

This favourite creature is distinguished by a modern writer by "his beautiful Arabian head,—his fine, and finely set-on' neck;—his oblique, lengthened shoulders; -well bent hinder legs;—his ample muscular quarters;—his flat legs, rather short from the knee downwards, although not always so deep as they should be—and, his long elastic pastern."

Although sometimes in the most beautiful modelled animal—possessing externally the most pleasing symmetry to the observer, there is a want of energy for which there is no accounting; yet there are two points just enumerated, which will rarely or never deceive—a well placed shoulder, and a well bent hinder leg.

So extensively is the race horse bred in England, that by some it has been thought, who are unacquainted with the fact, that the breed has retrograded: this supposition is undoubtedly futile, as it is well known that the eastern blood runs through the veins equally as pure as ever, but among so many competitors the superiority is not so striking. But if there be any cause which has produced this supposed diminution, it is the absurd and cruel practice of bringing out horses too soon, and the frequent failure of the legs before they come to full power, occasioning the failure of some of our most valuable horses before they have attained the age of maturity. Mr. Youatt, speaking on this head, observes, "Whether the introduction of short races, and so young horses, be advantageous, and whether stoutness and usefulness may not thus be somewhat too much sacrificed to speed; whether there may be danger, that an animal designed for service may, in process of time, be frittered away almost to a shadow of what he was, in order that at two years old, over the one mile course, he may astonish the crowd by his fleetness—are questions that more concern the sporting man than the agriculturist; and yet they concern the agriculturist too, for racing is principally valuable as connected with breeding, and as the test of breeding.

The horse enters into the spirit of the race as thoroughly as does his rider, and without whip or spur, will generally exert his energies to the utmost to beat his opponent. It is

beautiful to see him advancing to the starting-post, every motion evincing his eagerness. The signal is given, and he springs away—he settles himself in his stride—the jockey becomes a part and portion of him; every motion of the arms and body corresponding with and assisting the action of the horse. On he goes, eager, yet husbanding his powers. At length, when he arrives at the distance from which the rider knows that he will *live home* at the top of his speed, the hint is given and on he rushes. Then the race in reality begins, and every nerve is strained to head his competitor. Then too comes the art of the rider, to keep the horse within his pace, and, with admirable *give and take*, add to the length of every stride. Then perhaps, the spur, skilfully applied, may be necessary to rouse every dormant energy. A sluggish lurching horse may need more punishment than the humane observer would think justifiable, but the natural ardour of the race horse, roused at the moment of the grand struggle, bv the moderate application of the whip and spur, will bring him through if he can win."

We reprobate wanton cruelty in riders: often has a horse lost a race through their unskilfulness in applying punishment unnecessarily. The same feeling of emulation which exists in the human heart, is to be found in the struggles which the race horse has been known to make to surpass the speed of his opponent. We could enumerate several instances when the horse has been over-matched and his strength declining as he approached the goal, seize on some part of the body of his opponent to prevent his being outdone.

The art and mystery of training the race horse, as well as the hunter, is so much mixed with absurdity as to defy the understanding of a common capacity; but, after all, the grand secret of preparing both for work consists in attending to the following directions, viz—by physic and by exercise to get rid of all superfluous fat and flesh, without too much lowering the animal; and particularly to bring him to the full trial of his powers, without over-straining or injuring him. Two or three doses of physic, as the season approaches, and those not too strong,—plenty of good hard meat, and a daily gallop of a couple of miles, at a pace not too quick, will be all that can be required. Physic must not be omitted; but, the three words,—air, exercise, and food, contain the grand secret and art of training.

It is not our intention to enter much into detail on the race horse, as it is not so intimately connected with the object of our work: we shall conclude this part of our subject by giving the following table of abbreviations used in designating the various courses at Newmarket, with the distances of each, and a few particulars connected with racing.

	Abbrev.	*Miles.*	*Furl.*	*Yds.*
The Beacon course	B.C. is	4	1	138
Round course	R.C.	3	4	187
Last three miles of B.C. ..		3	0	45
Ditch-in	D.I.	2	0	97
The last mile and distance of	B.C.	1	1	156
Ancaster mile	A.M.	1	0	18
From the turn of the lands in		0	5	184
Clermont course (from the ditch to the Duke's stand)		1	5	217
Audley End-Course (from starting-post of T.Y.C. to end of B.C.) about		1	6	0
Across the Flat	A.F.	1	2	24
Rowley mile	R.M.	1	0	1
Ditch mile	D.M.	0	7	178
Abingdon mile	A.M.	0	7	211
Two middle miles of B.C.	T.M.M. B.C.	1	7	125
Two-year-old course (on the flat)	T.Y.C.	0	5	136
New ditto (part of the Bumbury Mile		0	5	136
Yearling course..........	Y.C.	0	2	47
Bumbury Mile	B.M.	0	7	208

A *distance* is the length of two hundred and forty yards from the winning post. In the gallery of the winning post, and in a little gallery at the distance post, are placed two men holding crimson flags. As soon as the first horse has passed the winning post, the man drops his flag; the other at the distance post drops his at the same moment, and the horse which has not then passed that post is said to be distanced, and cannot start again for the same plate or prize.

A *Feather-weight* is the lightest weight that can be put on the back of a horse.

A *Give and Take Plate* is where horses carry weight according to their height. Fourteen hands are taken as the standard height, and the horse must carry nine stone, (the horseman's stone is fourteen pounds). Seven pounds are taken from the weight for every inch below fourteen hands, and seven pounds added for every inch above fourteen hands. A few pounds additional weight is so serious an evil, that it is said, seven pounds in a mile-race are equivalent to a distance.

A *Post Match* is for horses of a certain age, and the parties possess the privilege of bringing any horse of that age to the post.

A *Produce Match* is that between the produce of certain mares in foal at the time of the match, and to be decided when they arrive at a certain age specified.

THE HUNTER.

In olden times there was not that necessity when pursuing the hounds to have such high mettled animals as the modern hunter, which amalgamates very closely to the race horse; but the improvement which has been made in the breeding of hounds, upon the principle of increasing speed, is such that no huntsman of the olden school, mounted on his favourite, would be enabled at the present day to attain the seat of his ambition by being in at the death. [In former days a hunter was one thing, and a race horse another, in these days they are nearly the same, and the qualifications for an hunter's stakes consist in walking a race horse in his sheets, into the same field where hounds are, and in the phrase of the turf, "letting him look at them," and from which he really becomes as much of a hunter as the man who rides him.

The reason why blood was not so essentially necessary in the hunter formerly as it is now, the country was less clear of woodland and other impediments, and therefore speed was not so desirable as strength, and even now, in thickly inclosed countries, the half-bred horse may get tolerably well along, but for general use, the hunter should be at least three quarters bred, perhaps seven-eights, not under fifteen nor more than sixteen hands high; and in fact if a *thorough-bred horse* could be obtained of bone enough, and different action, he would undoubtedly be considered the best of all horses for hunting; but the racer, at three quarters speed, does not carry himself sufficiently high to be aware of and clear the fences, and therefore is not calculated for the field.

Probably there is no modern writer on the qualifications of the hunter, has equalled the description given by Mr. Youatt, who says—"The first property of a good hunter is, that he should be light in hand. For this purpose his head must be small; his neck thin, and especially thin beneath; his chest firm and arched, and his jaws wide. The head will then be set on. It will form that angle with the neck which gives a light and pleasant mouth.

Somewhat of a ewe-neck, however it may lessen the beauty of the race horse, does not interfere with his speed, because more weight may be thrown forward and consequently the whole bulk of the animal be more easily impelled; at the same time, the head is more readily and perfectly extended, the wind pipe is brought almost to a straight line from the lungs to the muzzle and the breathing is freer. Should the courser in consequence of this form of the neck bear more heavily on the hand, the race is soon over; but the hunter may be our companion and our servant through a whole day, and it is of essential consequence that he shall not too much annoy and tire, by the weight of his head and neck. The forehead should be loftier than that of the racer. A turf horse may be forgiven if his hind quarters rise an inch or two above his fore ones. His principal power is wanted from behind, and the very lowness of the forehead may throw more weight in front, and cause the whole machine to be more easily and speedily moved. A lofty forehead, however, is indispensible in the hunter; the shoulder as extensive as in the racer; as oblique and somewhat thicker; the saddle will then be in its proper place and will continue so, however long may be the run.

The barrel should be rounder to give greater room for the heart and lungs to play and send more and purer blood to the larger frame of this horse; and especially more room to play when the run may continue unchecked for a time that begins to be distressing. A broad chest is an excellence in a hunter—the blood is hurried through the lungs quicker, and respiration is increased in the exertion of the chase, and therefore if the chest be not sufficiently broad, the horse is liable to be blown. The majority of horses that perish in the field are narrow chested.

The arm should be as muscular as that of the courser, or even more so, for both strength and endurance are wanted. The leg should be deeper than that of the race horse, and especially beneath the knee. In proportion to the distance of the tendon from the cannon or shank bone, and more particularly just below the knee in the mechanical advantage with which it acts, the leg should be shorter. Higher action is required than in the racer, to encounter the difficulties of leaping. The pastern should be shorter and less slanting, yet retaining considerable obliquity. The long pastern is useful, by the yielding resistance which its elasticity affords, to break the concussion with which the race horse from his immense stride and speed must come on the ground, and the oblique direction of the different bones beautifully contributes to effect the same purpose. With this, weakness is connected, the hunter takes not the long strides, and therefore strength to support the fatigues is more necessary. Some obliquity however is wanted, otherwise the concussion even of his shorter gallop, and more particularly of his frequently tremendous leaps, would inevitably lame him.

The foot of the hunter is a material point. The racer's work is always conducted on the turf; hence bad feet are not of so much consequence as they are to a hunter, as in tra-

versing over a flinty road or stony ploughed field, unless the foot is good, the horse will soon be disabled.

The position of the feet requires some attention in the hunter, they should if possible stand straight. If they turn a little outward there is no serious objection, but if they turn inward his action cannot be safe, particularly when he is fatigued or over weighted.

The body should be short and compact in comparison to the race horse, as in a heavy day's work in long strides, so much stress on the pastern would be particularly disadvantageous. The compact short strided horse will almost skim the surface, while the larger reached animal will sink deep, and he will wear himself out by efforts to disengage himself. It fact, it is well known, that a short bodied horse in climbing hills has a decided advantage, and hence the secret of suiting the *race horse* to his course, and unfolds the mystery of a decidedly superior horse on a level being beat by a far shorter strided horse on uneven ground with several turnings. In conclusion,—the loins should be broad, the quarters long, the thighs muscular, the hocks well bent and well under the horse.

There can be no doubt whatever but that training is advantageous to the hunter before he commences his work, and it will be very conspicuous in the comparison drawn in a hunt between the untrained and trained horses;—the one covered with lather, which evinces undeniable inferiority; yet, after a short burst, and a sudden check, and the weather cold—the stabled horse will, from the exposure to the cold, receive considerable injury, and sometimes carry home the seeds of dangerous disease, while the other accustomed to all weathers is not affected. Some, however, say that horses that are taken up and worked in the day, and with a feed or two of corn, and turned out at night with an open stable or shed to run into if they please, are as active, healthy, and enduring as those who are more carefully trained,—as directed in the description of the race horse,—and confined to the stable during the hunting season. Many a farmer has boasted that he can beat the most numerous and best appointed field, and that his horse never wants wind and rarely tires.

The hunter, in order to his behaving well in the field, ought to have great care and indulgence in the stable; he ought to have as much rest and quiet as may be, to be kept well supplied with good meat, clean litter, &c. Under proper care he may be fairly ridden twice, and if not hard, three times during the week,—but after a hard and distressed day's run with but little intermission, some few days rest should be permitted him. About thirty days work is considered a season; but one instance, not surpassed, a horse was known to have followed the fox hounds upwards of seventy times during one season.

It is pleasing to observe with what enthusiasm both riders and horses enter into the pleasure of the chase, for the one is as much interested in sport as the other. We have known the old hunter turned out to grass in the decline of his muscular powers, and when the distant cry has been brought trembling in the breeze to his ear, fired with his former strength, leap the boundaries of his confinement and follow in the field, and perhaps the foremost. Can we forbear censuring those riders who ill treat their horses at a time when every nerve is exerted to gratify their desire? The horse disdaining to yield to fatigue and voluntarily pressing on, and even sometimes until nature is exhausted, and he falls and dies; but much oftener the animal has intelligibly enough, hinted his distress; unwilling to give in, yet painfully and faulteringly holding on. The merciless rider rather than give up one hour's enjoyment, tortures the poor animal with whip and spur until he drops and expires. The symptoms of distress will soon be recognized by the drooping pace, and straggling gait and heaving flank and heavy bearing on hand, to which will be added a very peculiar noise. The inexperienced person will fancy it to be the beating of the heart, but that has almost ceased to beat, and the lungs are becoming gorged with blood. It is the convulsive motion of the muscles of the belly called into violent action to assist in the now more laborious breathing. The rider must be cruel indeed, if he does not immediately dismount; and if he possesses skill enough to take five or six quarts of blood away to relieve the lungs, the horse may then be enabled to reach the stable; when, or before which, some powerful cordial should be administered to rouse the exhausted powers and to prevent the reaction of inflamation. Cordials by the veterinarian are considered very injurious in their general application, and therefore should be but rarely resorted to. Sherry poured down the throat will give great relief, or even one dram and a half, or two drams of powdered ginger, mixed with warm ale, or ale strengthened with rum or gin, if a cordial is not at hand, will be found very serviceable. When he gets home, or if he stops at the first stable, he should be put into the *coolest place*, and then well clothed and diligently rubbed about the legs and belly. The practice of putting the animal thus distressed into " a comfortable warm stable," and excluding every breath of air, has destroyed many valuable horses.

The above stimulants which we have recommended, would, if used twelve hours after, prove fatal; but taken at a time when life is drooping, it acts as an incitement. As soon as a veterinary surgeon can be procured in whom confidence can be reposed, it will be advisable to give up the charge to him.

After the hunting season is over, the farmer makes no material difference in the diet of his hunter, but the gentleman's trained horse is not so easily managed. We differ much from many, especially in confining the horse in a close place instead of being permitted to gambol about in a comfortable field. Our management would be as is recommended by

Mr. Youatt:—"Let the horse be turned out as soon as possible after the hunting season is concluded. Let him have the whole of May. and the greater part or possibly the whole of June, but when the grass fails and the ground gets hard and the flies torment, let him be taken up. All the benefits of turning out, and that which a loose box and artificial physic can never give, will have been obtained without the inconvenience and injury which attend an injudiciously protracted run of grass; and which, arguing against the use of a thing from the abuse of it, have been improperly urged against turning out at all.

The spring grass is the best physic that can possibly be administered to the horse. To a degree which no artificial aperient or diuretic can attain, it carries off every humour which may be lurking about the animal, it fines down the roundness of the legs, and except some bony enlargement, restores them almost to their original form and strength. When, however, the summer has regularly set in, the grasses cease to be succulent, aperient, or medicinal; the ground is no longer cool and moist, at least during the day; and a host of tormentors, in the shape of flies, are from sun rise to sun set persecuting the poor animal. Running and stamping to rid himself of his plagues, his feet are battered by the hard ground, and he newly and perhaps more severely injures his legs—thus kept in a constant state of irritation and fear—he rapidly looses his condition, and sometimes comes up in August little better than a skeleton."

THE ROAD HORSE.

This description of horse,although very serviceable in contributing to the conveniences of social life, is rarely to be met with in perfection; he should have good fore legs and good hind ones, feet sound, even tempered and no starter, quiet in whatever situation he may be placed, not heavy in hand, and never disposed to stumble. The general notion that the hackney should lift his legs well and he will never come down, it is in a degree erroneous; the higher the feet are raised the greater the force on coming to the ground—and the greater the danger in case of a stone or other casualty in the road, in addition to which, is the unpleasantness which the rider feels, as well as the battering and wearing of the feet; therefore more dependance is to be given on the manner in which the horse places his feet to the ground, than in the knee action in raising them up—more on the foot being placed at once flat on the ground, or perhaps the heel coming first in contact with it, than on the highest and most splendid action. Whilst, if the toe dig into the ground before the foot is firmly placed, a little thing will cause a trip and a fall.

There are some points which in forming a judgment of a roadster should be strictly observed: they are the following—"The shoulders and fore legs of the feet; because a horse whose shoulders are properly formed and placed is not liable to fall down, and because his soundness chiefly depends upon his legs and feet. The shoulders should not be too upright, but should slope backwards from the shoulder point to the withers. It is desirable, if the horse is intended to carry a man of much weight, that the shoulders should be rather thick than thin; but it is essential that they should not be too large at the points A horse whose shoulders are good, stands when in a natural position, with his fore legs in a line perpendicular to the ground; it is, therefore, very desirable that the purchaser should see him in the stable and before he has been moved, for he will then find him in his natural position, in which it may be difficult to place him after he has been once disturbed. Another mode of ascertaining whether the shoulders are properly placed, is by allowing the horse to walk past you, and to observe whether he place his fore foot more forward than the shoulder point when he puts it on the ground. A horse whose shoulders are properly formed will always do so, one whose shoulders are upright cannot. The fore quarters of a horse intended to be used as a hackney, constitute an essential point; his carcase should be round and his ribs deep. A horse's fore leg of the proper form should be flat, and as large under the knee as it is just above the fetlock. The pastern should be subjoined to the leg at the fetlock, that the horse should neither turn his feet out or in, but it is less objectionable that the horse's feet be turned outwards than inwards, providing he bits not his fetlocks.

THE FARMER'S HORSE.

Of the nature of this horse much depends on the description of work for which he is to be used. It is now well known that that bulky animal which was formerly employed for agricultural purposes, is not so well calculated for the general business of the farm as one somewhat less in size yet not deficient in strength. The horse appropriated for riding occasionally, but principally employed in draught, should be about fifteen hands and two inches, which may be placed as a standard; posessing a shoulder thicker, lower, and less slanting than would be found in a hackney, which will be the properties wanting in draught, and will better suit the collar. A stout compact horse, not too heavy, and with a little blood, or even a half bred horse, will have preference.

Horses of this description will be cheaper to keep, and move with greater celerity, than the unwieldy farm horse of past days which will be found particularly advantageous in harvest as well as in winter; and the fine days of carting or harrow-work will not unfit him for the saddle, especially if the rider feels his mouth, and has not over-worked the animal, but kept him in good condition.

Mares are certainly better calculated for the small farmers, as in addition to their being equally as strong, and perhaps bulk for bulk much stronger, they open a source of profit of which a careful farmer may avail himself in breeding from them. To assign an obvious reason why the breeding of horses is confined so much as it is to northern counties would be difficult; we can see no objection whatever, where conveniences are at hand, why England should not have breeders as extensively in the south.

If the farmer has a few useful cart mares, and crosses them with a well knit half-bred horse, he will certainly have colts useful for every purpose of agriculture, and some of them sufficiently light for the van, post-chaise, or coach. If he has a superior mare, one of the old Cleveland breed, and puts her to a bony thorough-bred horse, he will have a fair chance to rear a colt that will amply repay him as a hunter or carriage horse.

In breeding, however, the farmer should carefully avoid the mare which has any imperfections or disease, as either the one or the other will descend to the foal; and he should also constantly keep in mind the necessity of keeping the foal well, without which it will be much injured, as nourishment is highly necessary while young, and which if stinted, however much may be given afterwards to bring the young horse into condition, the traces of evident neglect will still be conspicuous.

More depends on the quality of the mare for breeding than is generally understood, and therefore the breeder should carefully avoid an undersized or a blemished or unsound mare; she will do well enough probably for working on the farm, but for breeding will be altogether unfit. A roomy mare with some blood in her, and with most of the good points, will alone answer the purpose. She may bear about her the marks of honest work (the fewer of these however the better), but she must not have any disease.

The foal, as has been stated, should not be stinted for the first two years, but should be closely attended to. At about three years, whether for a hunter or carriage horse, he may be broken in; if for carriage, the best and most advantageous manner will be by making him earn a part of his livelihood. Let him be put to harrow or light plough, which will contribute much, by his walking over ploughed ground, to give him that showy action so necessary for the carriage horse, but inexcusable in all others. The next year the colt will be fit for the markets.

THE CARRIAGE HORSE.

This animal has, like others, undergone the change which improvement has caused; the bulky looking horse which was used formerly is now extinct, and instead of that prancing black family horse, which was generally done up with a hard day's work, and rarely going at a greater rate than six miles the hour, we have an animal as tall, deep-chested, rising in the withers, slanting in the shoulders, flat in the legs, with even more strength and treble the speed.

" There is, says Mr. Youatt, " a great deal of deception, however, even in the best of these improved coach-horses. They prance it nobly through the streets, and they have more work in them than the old clumsy sluggish breed; but they have not the endurance that could be wished,—and a pair of poor post horses, would, at the end of the second day, beat them hollow.

The knee action and high lifting of the feet in the carriage horse, is deemed an excellence because it adds to the grandeur of his appearance; but, as has already been stated, it is necessarily accompanied by much wear and tear of the legs and feet, and this is very soon apparent. The principal points in the coach horse are, substance well placed, a deep and well-proportioned body, bone under the knee, and sound tough feet.

The origin of the better kind of coach horse is the Cleveland bay, confined principally to Yorkshire and Durham, with perhaps Lincolnshire on one side and Northumberland on the other, but difficult to meet with, pure, in either county. The Cleveland mare is crossed by a three-fourths or thorough-bred horse of sufficient substance and height; and the produce is the coach horse most in repute, with his arched, erect, and high action. From the thorough-bred of sufficient height, but not of so much substance, we obtain the four-in-hand and superior curricle horse.

From less height and more substance, we have the hunter and better sort of hackney; and from the half-bred we derive the machineer, the porter, and the common carriage horse; indeed, Cleveland, and the Vale of Pickering, in the East Riding of Yorkshire, may be considered as the most decided breeding county in England for coach horses, hunters, and hackneys. The coach horse is nothing more than a tall strong undersized hunter. The hackney has many of the qualities of the hunter on a small scale."

The same author excellently remarks:—" There is no truth so easily proved, or so painfully felt by the postmaster, at least in his pocket, as that *it is the pace that kills*. A horse at a dead pull, or at the beginning of his pull, is enabled, by the force of his muscles, to throw a certain weight into the collar. If he walk four miles in the hour, some part of that muscular energy must be expended in the act of walking; and, consequently, the power of drawing must be proportionably diminished. If he trot eight miles in the hour, more animal power is expended in the trot, and less remains for the draught; but the draught continues the same, and, to enable him to accomplish his work, he must tax his energies to a degree that is cruel in itself, and that must speedily wear him out.

Let it be supposed—what every horse cannot accomplish—that he shall be able, by fair exertion and without distress, to throw, at a dead pull, a weight into his collar, or exert a force equal to two hundred and sixteen pounds; or in other words, let him be able to draw a load which requires a force of two hundred and sixteen pounds to move. Let him next walk at the rate of four miles in an hour: what force will he then be able to employ? We have taken away some to assist him in walking, and we have left him only ninety-six pounds, being not half of that which he could exert when he began his pull. He shall quicken his pace to six miles an hour—more energy must be exerted to carry him over this additional ground. How much has he remaining to apply to the weight behind him? Fifty-four pounds only. We will make the six miles an hour ten; for it seems now to be the fashion for the fast coach, and for almost every coach, and every vehicle to attempt this pace. How stands the account with the poor beast? We have left him a power equal to thirty-two pounds only to be employed for the purpose of draught.

The load which a horse can draw is about fifteen times greater than the power exerted, supposing the road to be hard and level, and the carriage to run with little friction; and the horse which at starting can throw into the collar a weight or force equal to two hundred and sixteen pounds, will draw a load of three thousand two hundred. Let him, however, be urged on at the rate of ten miles in the hour—deduct the power used in swiftness of pace from the sum total of that which he possesses, and what remains?—not a sixth part—not that which is equal to a quarter of a ton—or, if it be a stage-coach, the energy exerted in draught by the four horses will not be equal to a ton.

The coach, and its passengers and its luggage, weigh more than this, and the whole is still drawn on, and must be so. Whence comes the power? From the over-strained exertion, the injury, the torture, the destruction of the horse. That which is true of the coach-horse, is equally true of every other. Let each reader apply it to his own animal, and act as humanity and interest dictate.

Many a horse used on our public roads is unable to throw all his natural power or weight into the collar. He is tender-footed—lame; but he is bought at little price, and he is worked on the brutal and abominable principle, that he may be "*whipped sound.*" And so apparently he is. At first he sadly halts; but urged by the torture of the lash, he acquires a peculiar habit of going. The faulty limb appears to keep pace with the others, but no stress or labour is thrown upon it, and he gradually contrives to make the sound limbs perform among them all the duties of the unsound one; and thus he is barbarously "whipped sound," and cruelty is undeservedly rewarded. After all, however, what has been done? Three legs are made to do that which was almost too hard a task for four. Then they must be most injuriously strained, and soon worn out, and the general power of the animal must be rapidly exhausted, and, at no great distance of time, exhaustion and death release him from his merciless persecutors."

HEAVY DRAUGHT HORSES.

The *Cleveland-bays* are a breed or variety of horses that have derived much advantage from judicious crossing. They are principally distinguished for their colour, which is mostly bay—their form good—their size large—and their activity, strength, and hardiness, superior to most other sorts. With thorough-bred stallions this variety produces excellent hunters and saddle horses, and with half-bred stallions excellent carriage horses, and for the plough they are more quick, and are capable of great exertion. This valuable sort of horses is produced in different parts of Yorkshire, Durham, and Northumberland.

The Suffolk punches are another useful sort of horses for the purpose of the farmer. They are distinguished by their colour, which is mostly yellowish or sorrel, by having a white rutch or blaze in the face; by the head being large, ears wide, muzzle coarse, fore-end low, back long but straight, sides flat, shoulders too far forward, hind quarters middling but rather high about the hips, legs round and short in the pasterns, deep bellied, full in the flank, not large in size.

This on the whole, though but an ordinary sort of horse in regard to form, is found highly useful in draught, especially for the plough and cart. They are the most prevalent in the district of High Suffolk.

The *Clydesdale Horses* are distinguished by their colour, which is mostly grey or brown; neck larger than in the Suffolk kind, head better formed, eyes more sprightly and animated, body lighter and better formed, legs clean and sinewy, step firm but nimble, size larger, from fifteen to sixteen and a half hands high. This is a strong, hardy, and active sort of horse, which is said to have been produced by crossing Scotch mares with hunter stallions. They are remarkably true in their draught. This sort of horse is predominant in the district which bears its name in Scotland.

The *Heavy Black Horses* are a sort that may be employed with advantage for some purposes of draught, but are not in general well adapted to the uses of the farmer. This kind is distinguished by the colour being constantly dark black; by being clumsy in their form, and seldom well proportioned, slow in their motion, with rough fleshy legs; the size large.

This breed of horses is found to prevail in the midland districts, as in Leicestershire, Derbyshire, Lincolnshire, &c. where the mares are chiefly employed in farm labour; the

horses being disposed of according to their sizes; the largest for dray horses, the next for draught in waggons or other teams.

It is evident from the nature of these different sorts, that for the purposes of farm labour, horses must be chiefly selected from the Cleveland, the Suffolk, and Clydesdale kinds; the first affording such as are adapted to great exertion and dispatch; the improved sort of the Suffolk kind being well suited to field work where much perseverance is required, as they can be constantly employed in this sort of labour without inconvenience; and the last sort from the great muscular exertion that can be occasionally employed, as well as their being true in the draught, are particularly suited to hilly situations, In respect to economy in keep and the expence in procuring, the two last sorts are probably to be preferred, as they are both very hardy in their dispositions, and can in general be obtained at easy prices. From the great advantage that has lately been found in employing, even for the purpose of draught in the more heavy sort of carriages, such horses as have a little of the blood kind in them, the use of the heavy breeds is becoming daily less frequent and necessary.

BREEDING.

To whatever cause may be attributed the decrease of useful horses in England; whether it be from poverty or from a want of knowledge on the part of breeders, or to the exportation of mares, of this we are certain, that a good horse may be bred at nearly the same cost as a bad one; and yet from not attending sufficiently to the matching the sire with the dam, we now have to regret, the places of good horses being occupied by a comparatively useless breed.

Experience has taught us, unless the mare possesses points of excellence, and is in good health and of good breed, it is almost immaterial to what horse she may be put—her offspring will not possess that value which for the profit of breeders is so desirable. However beautiful the symmetry of the horse may be—however valuable his qualities—if the mare be not equally so, these qualities will not descend to the foal—but will, in all probability, be neutralized from the defective form or want of blood in the mare.

So unskilful are some breeders in matching, that although both sire and dam may possess some good points, yet in the offspring these will be lost, and the good qualities of the parents completely annihilated. Great judgment therefore is requisite, and instead, as is commonly practised, of breeding from an indifferent mare, care should be taken that the faults which are observable in either, should be counteracted by a predominancy in the other. It is from want of a sufficient attention to these facts, that useful horses have been less bred of late years in England than formerly. The breed of the racer remains now of equal excellence, and in all probability superior, attributable only to the care taken in matching.

It may, perhaps, be justly affirmed that there is more difficulty in selecting a good mare than a good horse, because she should possess somewhat opposite qualities. Her carcase should be long to give room for the growth of the fœtus, and yet with this there should be compactness of form and shortness of legs. In selecting the horse and mare particular care should be taken that both have good eyes, sound feet, and free from vice, crib-biting, roaring, ring bones, spavins and curbs, as these will descend from either sire or dam to the foal; and even if these blemishes do not appear in the immediate generation, they will generally be conspicuous in the next. It is also worthy of remark, that if the mare is in low condition and has been ill-treated, the foal will show an unkindliness in growth and a corresponding weakness.

In selecting the horse much depends upon the progeny required. *Cart Colts* are bred by putting good fine cart mares to Derbyshire, Leicestershire, or Lincolnshire stallions; the mares should be as nearly as possible of the same size as the horse. *Coach Horses* are obtained from cart mares with thorough-bred horses, and mares from these latter produce good hunters. It was formerly the practice to put half-bred horses to mares got by thorough-bred horses out of cart mares, but the practice is considered disadvantageous at the present day and is therefore abandoned.

"On the subject of breeding in and in, that is, persevering in the same breed, and select ing the best on either side, (a popular writers remarks) the system of crossing requires much judgment and experience, a great deal more indeed than breeders usually possess. The bad qualities of the cross are too soon engrafted—and once engrafted, these are not for many generations eradicated. The good ones of both are occasionally neutralized to a most mortifying degree. On the other hand, it is the fact, however some may deny it, that strict confinement to one breed, however valuable or perfect, produces gradual deterioration. The truth here, as in many other cases, lies in the middle; crossing should be attempted with great caution, and the most perfect of the same breed should be selected, but varied by being taken from different stocks. This is the secret of the course. The pure south-eastern blood is never left, but the stock is often changed with manifest advantages."

Probably there is no nobleman in England who has been more assiduous in promoting the improvement of the breed of horses, than the Right Hon. the Earl of Egremont, to whom all agriculturists are particularly indebted. This nobleman in a manuscript furnished us, recommends as the most profitable, useful, and best calculated in a pecuniary point of view, for the occupiers of land in Sussex, the annexed description of horse, for which he

offers a premium of £20 annually at Egdean Fair, to the owner of the best three-year old colt or filley, not less than 15 hands and an inch, fit for hunting or quick work in carriages, (but not for racing or the cart) bred in Sussex, or in parishes in Surrey or Hampshire, contiguous to Sussex, and £5 to the second best. "With respect to the means of breeding them," continues this nobleman, "I should advise the gentlemen and farmers to get strong mares, but not of the cart breed, and as large a size as possible, for the average of the progeny will generally fall rather below the standard than above it. The stallion should be a strong thorough-bred race horse, with good sound legs and sinews, which is a quality in which many of the speediest race horses are deficient. The mares should be covered so as to produce their foals in April or May."

The time lost in the service of the mare while breeding is but trifling, as she may be put to horse in April or May, and afterwards moderately worked until near the time of foaling, gentle exercise having a beneficial tendency. In the gentleman's stud, very frequently mares in training are put to the horse in spring, and are run during the year afterwards, being considered by judges to run somewhat the better. Mares purchased by private individuals, intended for breeding, are not unusually rode until the spring, at which time they are put to horse, and afterwards used in business until within a month or two previous to foaling.

The term of gestation varies with different mares, from eleven to twelve months may be considered the usual period. It will be necessary to remark the time the mare goes to horse, as when the eleventh month has nearly expired, she should be watched and shut up during the night in a safe yard or loose box by herself, and during the day in a field where there are neither bogs, ditches, nor other dangerous places.

When the mare has been pregnant four or five months, she should be allowed better food, which, with moderate exercise, will do much to prevent her from slinking her foal; which, when it does occur, usually takes place at about this stage of her pregnancy. She should likewise be kept away from other horses, or they will also be endangered.

The mare usually gives a day or two's notice previous to her delivery, (which nine times out of ten takes place at night), by an adhesive matter which will appear about her teats.

If the mare has been regularly excercised and apparently in good health, little danger will attend the act of parturition. If there should be a false presentation or difficulty in producing the fœtus, it will be better to have recourse to a well informed practitioner, rather than injure the mother by the violent and injurious attempts which are often made to relieve the animal.

Should the mare foal successfully abroad in a well sheltered pasture, and the weather favourable, she may remain out; but should it be bad, wet, cold weather, she and her foal should be taken in. Unless the weather is particularly auspicious both must be kept in stable during the nights. But when the mare is in a fit condition, which may be in about a month or two after foaling, moderate work will certainly not be injurious, and the exercise which the foal will have in following her, will contribute much to its increasing strength. If it is found advisable to shut up the colt, it should never be permitted to suck until the mare is perfectly cool. Care should be taken while the colt is young that it be not frightened, for the general cause of evil disposition in horses may be traced to bad management in youth.

After foaling the mare should be fed well in company with its colt, which will in a short time learn to eat. Good grass will be found particularly beneficial to both, they should therefore be turned out; but it will be advisable to feed them on corn night and morning, and also to shut them up every evening in the stable. If the mare does not give an ample supply of milk, mashes must be used, which will in general answer extremely well.

At Michaelmas the foal may be taken away from the mare and turned into a loose place, where it may be fed on oats and bran. In about a week after, it may be led out with a halter to make it tractable and handy. Where there is not a good run it will be advisable frequently to have this done, to give the colt an airing; after a few times the cavesson may be put on. A dose of physic will not be improper to be given once in three months. Continuing this practice, the colt will become very gentle; corn and hay should be regularly given, and in favourable seasons the colt may be turned out to grass; but even then it should be fed with corn every morning before it is turned out, and every evening before it is locked up.

During the first two years the colt should be well kept on corn; to stint it while growing is higly injurious, as it will always bear the traces of this bad management, and will be materially injured in value. During the winter, and until spring, it may be fed on corn and chaff. When good grass is attainable the corn may be dispensed with, and much benefit will be found by the colt being turned out. In autumn it should be taken up and fed as before on oats and chaff.

At two years old, the colt, if for harness, may be put to plough or harrow, and worked moderately. This gentle work and habituating the colt, brings up the shoulders, and gives it a better shape for the use for which it is intended. If for the purposes of riding, it may be broke in, and gently rode for about a week, when it should be turned out again.

It is injudicious and a fault in judgment, to put the mare to horse at too early an age, and before she has arrived at maturity. We would never recommend breeding before she has attained the age of four or five years, although mares will breed from two years old to thirty, and instances are known after that age;—it is said the Tartar mare bred Queen Mab at the surprising age of thirty-six years. In studs the mares are permitted to breed, until they have attained the age of from eighteen to three or four and twenty years.

TRAINING AND COLT BREAKING.

In training the colt, whether for the saddle or harness, much more is to be done by kind usage and enticement than by severity and impatience; and in order to render the animal docile and tractable, it is absolutely necessary that quiet and gentle means should be resorted to. Few of our domestic animals possess such a retentive memory as the horse; retaining, in a surprising manner, the recollection of ill usage and abuse, and rarely if ever forgetting the tricks taught it when young. This, then, shews the necessity of paying every possible attention to the elementary education of the horse.

The first circumstance to be attended to in the management of colts, is, to make them familiar with man; at a very early period they should be frequently, but at first, gently handled, patted on various parts of the body, and fed occasionally from the hand. Objects of various colours and forms should then be shown them with caution, and placed upon their heads and backs. They should be frequently led out with their dams into roads, frequented by carriages, carts, &c. but great care is necessary in such ramblings to prevent them from being frightened. By this management almost all the trouble of breaking will be saved, and will be found to have operated materially in forming the future disposition of the animal.

Training for the Saddle.

At the age of two years the training may commence in earnest; if delayed till the animal be four years old, its strength and obstinacy will be more difficult to overcome, and consequently a longer time will be required in teaching it subjection.

The cavesson is the first part of the breaking tackle used, after this has been properly placed upon the head, the colt should be led out and practised to walk steadily round a ring. The next lesson is to teach it its paces by making it walk right and left within a small circle, and when it has attained this knowledge it may then be urged on to a gentle trot, for about twenty minutes. The next process is to bit and caparison it with the full tackle, the saddle having a cross or something elevated upon it in order to accustom the colt to a rider. In putting on the tackle it should not at first be drawn too tight, but be done gradually. The colt is shortly after lunged round a circle, being held by the breaker, who stands whip in hand in the centre, urging it successively into its different paces.

Backing follows in a few days. This is by no means difficult if the colt has been taught familiarity by early handling and kindness. The first *backing* of a horse is a thing of great consequence, and its value afterwards very much depends upon it. It should be performed a few times in the stable previously to its being attempted out of doors. In getting on; the rider should not be too hasty, but before he seats himself should rise a few times in the stirrup, and by several risings and heavings, accustom the colt to the motion. If the colt bears this patiently, the rider may place himself firmly on his back; but if he is any ways restive the person must not then attempt to take his seat, but give the colt another lunging over some light ploughed ground, till he becomes more fatigued and willing to receive the rider gently upon his back. By kindness and encouragement, the animal will by degrees be brought to know that it is his business to be quiet and governable. Teaching the animal the different paces, with the rider upon his back, "commences" says Lawrence, "with the walk and slow trot, and giving him a good mouth, neither obdurate or too tender, but such as will endure a pull when necessary; in fine, making him a good snaffle bridle horse. The excessive tenderness and delicacy of mouth given to horses educated for military purposes, do not so well befit those intended for any other. A speedier trot, canter, and gallop, follow all natural paces; but each of which the horse must be accustomed to perform steadily on the intimation of his rider, and without shuffling the one into the other. It will soon appear whether the colt be naturally inclined to the trot and to excel in it; but should that be apparent, the colt should never be pushed forward to any excess, from the risk of injury to his joints. A graceful canter should be encouraged, commencing with the proper or off leg foremost, and the nag accustomed to be pulled up from the canter to the trot without unsightly and unpleasant blundering. The same of the gallop, which like the trot should not be pushed to speed, with colts. The lesson should not be too long or fatiguing, but the young animal kept in as cheerful and easy a state as possible."

During the first two or thee times the animal is led in from exercise, a person should hold his head while another dresses it, and the feet taken up frequently in the stable will make them handy, which will be particularly desirable before the colt is taken to the blacksmiths, as that antipathy which many horses have in undergoing the operation of shoeing will be effectually avoided.

The colt being subdued and docile, the next object is to accustom it as much as possible to the road.

Training for the Harness or Draught.

This is a matter of far less difficulty than that of the former. A cart colt may be put to work early, but the work must at first be moderate and the treatment gentle. It is necessary that this species, as well as the saddle horse, should have a good mouth given it; in short, the horse destined for the harness, whether for quick or slow draught, being bound to obedience by its harness and the vehicle to which it is attached, learns its duty and receives its education chiefly from its partners.

The coach or carriage-horse is trained in a vehicle termed a *break*, too well known to need description, as is the mode of training.

While some colts may be broken and become useful in a short time, "there are a few (Lawrence observes,) and these far too many, which the devil himself, in the guise of a horse-breaker, would be utterly unable to tame, these, the heritage of which is restiveness, a vice which, though temporarily subdued by excess of severity, will never fail throughout life to re-appear on certain occasions; and no occasion more probable than the subtle brute being conscious of a fearful rider. Great is the pity that it cannot be afforded to knock these on the head at once. Many broken limbs and lost lives might thence have been saved. The case of shying should be particularly attended to by the breaker. It arises from three causes—actual fear, skittishness and roguery. The more racing blood a horse has, the less he is subject to this infirmity or vice. The only remedy in this case is to *hold hard and be quiet:* as to the whip and spur, and the silly checking of a really fearful horse with a sharp curb, as though the intent were to break his jaw bone, it is truly a noodling, unthinking, as well as a cruel practice, it is, in fact, an excellent recipe to advance the nag in the noble accomplishment of shying and starting, since in association with the object he naturally expects the whip and spur."

"With *affected* shyers," continues Lawrence "some severity may be necessary. These chaps generally fix upon some particular shying butt; for example, I recollect having at different periods three hacks, all very powerful, the one made choice of a windmill for the object or butt, the other a tilted waggon, and the last a pig led in a string. I was once placed in a very dangerous predicament by this last, on a road filled with carriages. It so happened, however, that I rode the two last when amiss from a violent cold, and they then paid no more attention to either windmills or tilted waggons than to any other objects, convincing me that their shying when in health was nothing more than pure affectation. It is a thing seldom, perhaps never thought of or attended to, which however detracts nothing from its consequence, to accustom colts during their breaking to all the chief objects of terror which occasion the vice of shying. After a colt shall have been a considerable time in hand, and his education nearly finished, should he be a careless and blundering goer, he should be frequently but with great care (*beware of broken knees*) exercised daily over rough and uneven roads."

It is sometimes the case, owing to the foolish practice of suffering colts to run wild to the age of four or after, that they are found to be totally ungovernable, and the task of breaking rendered both dangerous and difficult, as an instance of which we remember a colt which had scarcely been handled before the age of four years, on putting on the breaking tackle, it became so exceedingly violent that it nearly deprived one of the men of life who was engaged in harnessing it. Day after day it evinced the same ungovernable disposition, and although every means were resorted to, it still held subjection at defiance. One morning while the harness was putting on, it plunged so desperately to rid itself of the trappings, that it fell dead upon the spot. In such cases as these, one act of harshness will only double and treble the difficulty and danger, patience and kindness being the only means by which the desired object can be effected.

Lastly, in speaking of the breaking of colts, no person should be intrusted with it but a regular, steady, and experienced man; a person perfectly competent for the task, and whose most important qualification is unwearied patience, the next undaunted courage, joined to that indescribable quality which some persons naturally possess of being at once loved and feared by the animals. Here we have, as Lawrence says, the true "*domitor equorum.*"

Castration.—The period at which this most important operation is performed varies with different breeders. It is most commonly performed when the colt is twelve or eighteen months old, some even defer it much longer, thinking that the later the operation is performed, the more strength and spirit the horse will have acquired; but, on the contrary, it is not only attended with much greater danger at an advanced period, but is decidedly in opposition to the views which Phrenology unfolds to us of the sexual desire being connected with that part of the brain lying at the back of the cranium called the cerebellum. This fact, therefore, ought to evince to the breeder the propriety of performing the operation at an early age, otherwise the desire will prevail without the means of gratifying it.—(See *Phrenology.*)

It is to be observed likewise, that the severity of the operation occasions a check to the growth of the animal, which is more felt and of more consequence at an advanced period than when he is quite young it is also worthy of consideration in a pecuniary point of view, *viz.* the older the animal the greater will be the loss should the operation cause death. The most prudent time for performing the operation is rather late in the spring or early in autumn, when the air is temperate, and particularly when the weather is dry. When the operation is performed in the autumn they carry a better coat. It is too common a notion among many that colts should be cut in the months of June and July, when flies pester the horses, causing them to be continually moving about, and thereby prevent swelling. If the reader will but reflect one moment, he must be convinced that nothing can be more likely to cause inflammation and swelling than hundreds of flies constantly hovering about and stinging the sore parts. Alternations of heat and cold should be sedulously avoided after the operation. The exercise of running with the mare will promote the suppuration, and which will also be materially assisted by the warmth of her milk. The colt should by no means be suffered to drink cold water until suppuration is complete. It will be unnecessary to describe the operation, as that always is, or always ought to be, performed by an experienced veterinary surgeon.

Nicking is another but a most unfeeling operation performed upon some animals before they are deemed fit for general service. In order to compel the horse against nature to carry its tail cocked upwards or thrust out, they sever the joints, and thus form a callus, and at the same time keep the poor animal in constant torture by having the tail drawn up by pulleys for days together. This is certainly an abomination, but fortunately for our national character it has been for many years on the decline. The *broom* or racing tail appears to be the most fashionable.

Trimming.—In doing this the long hairs around the eyes are pulled, and those upon the nose and lips cut with scissors. The hair in the ears and beneath the chin are very foolishly permitted, according to ancient custom and much to the terror of the horses, to be singed off with a lighted candle. To these parts the scissors only should be used, leaving however a sufficiency of hair as a defence against cold, and the intrusion of flies and other objects.

Shoeing.—The importance of this part of the management of horses to the agriculturist, is sufficiently attested by the number of inventions, which, by the ingenuity of artists, are every day introduced to our notice. Almost every professor of the veterinary art has now his favourite shoe. It will, therefore, be impossible to enter into details of their respective merits. The operation of shoeing requires more skill and attention than is generally supposed; many valuable horses have been utterly ruined by the bungling manner in which shoes have been placed upon the feet by ignorant and inexperienced smiths. It is therefore an object of the first importance to every agriculturist, and indeed to every person possessing a horse, to take particular care under whose hands he places his animals to undergo this operation. Mr. Bracy Clark, Mr. Dick, and several other gentlemen, have lately directed the attention of the veterinary profession to new and improved varieties of shoes; but as these are matters of controversy, we must refer our readers to the various publications in which their merits are fully discussed.

Many horses have naturally imperfect and bad feet. It is here that the skill of the smith is required. In the art of shoeing, as in most other arts, there is a great variety of skill; some operators having an eminent superiority, while others void of all intelligence, shoe all hoofs, however imperfect, on one uniform plan, necessarily the best, as it is what they have always been used to, and is the method which their fathers, grandfathers, and great-grandfathers, pursued before them. The custom of common smiths to be continually cutting away the bars which separate the heel and frog, with the view, as they express it, of "opening the heels," is much to be deprecated, as one moment's reflection must convince the reader that it must have quite a contrary effect.

A shoe of a particular construction recommended by Mr. Mannington, an intelligent breeder at Uckfield, in Sussex, is well deserving the notice of every sportsman. This shoe is peculiarly adapted for hunters, and is so constructed as effectually to prevent balling or retaining the turf within the shoe. The advantages of this over all other shoes for the turf, consists in being hollow, so as to set close to the sole, and leaving no cavity between that and the edge of the shoe in which clods of turf could possibly adhere. Another advantage of this shoe is to enable the horse to go down a side hill with greater safety and confidence; its high edges taking a firm and sure grasp of the turf, and, unlike that of the common shoe, preventing the sledge-like descent of the animal down a steep hill.

DISEASES OF THE HORSE.

The diseases of the horse are so numerous and important, their causes frequently so obscure, and their symptoms so equivocal, that they are often recognized with difficulty and can only be treated successfully by one who has devoted considerable time and attention to the acquisition of knowledge, and the duties of his profession.

In all cases where the life of a valuable animal is at stake, we would recommend an immediate application for the services of a skilful practitioner, but when such

assistance cannot readily be procured, the following hints may be useful, as enabling the farmer to act with promptness and decision, in cases of emergency and doubt.

DISEASES OF THE HEAD AND NECK.

APOPLEXY.

This is a sudden and serious disease, the horse usually falls without warning, and dies on the spot; in other instances we are warned of approaching danger by certain premonitory symptoms,—the horse hangs down his head, extended almost to the ground, and supported against the manger, he reels as he stands, both sight and hearing are affected, and in this state he may continue for many hours;—at length he falls, grinds his teeth,—convulsive twitchings may be observed in the course of the muscles,—the eyes are protruded, they remain open and fixed,—the pupils are dilated, the fœces are passed involuntarily, the muzzle is cold, and the jugular or neck veins distended with blood,—and, unless relief is promptly afforded, convulsions and death speedily ensue. The case is usually hopeless; prompt and decisive measures can alone avail. Bleed, by means of a large orifice, from the jugular vein, to the extent of eight or ten quarts; next, empty the rectum by means of the hand, and give a strong dose of physic, (*Vet. Form.* 1.) The common practice of blowing pepper up the nostrils is decidedly wrong,—the effort of sneezing may produce a fresh effusion of blood if extravasation has already taken place, or otherwise cause a rupture of some vessel already over distended with blood.

MEGRIMS.

Megrims, or *pressure on the brain*, may arise either from an effusion of fluid in the ventricles of the brain, or a determination of blood to the head, produced by violent exercise, improper food, or negligence in the proper adaptation of the harness to the horse, whereby the due return of venous blood from the head, is prevented. The former affection is called hydrocephalus, or "water in the head," and occurs chiefly in foals or colts, old horses being seldom the subjects of attack. The latter affection, "Megrims," is of more frequent occurrence, and is certainly a dangerous disease; it occurs both in a *mild*, and in a *severe* form. In the *mildest form*, the horse, when trotting, suddenly stands still, shakes his head, and appears giddy; in a short time he recovers, and proceeds on his journey as if nothing had happened. In the *severest form* of this affection, the horse falls suddenly, without the least warning; or he first reels, suddenly runs round, and then falls. He either lies motionless for a short time, or becomes convulsed, struggling violently for five or ten minutes, and then recovers and proceeds on his journey, dull and exhausted. If possible he should be bled at the moment of attack to the extent of three or four quarts; in the mean time the harness may be examined, especially the collar, the curb, and the bit. If the circulation of the blood has been obstructed, from the pressure of the harness, there will be a greater chance of success in the future treatment. The horse should next be encouraged to proceed on his journey, as gently as circumstances will permit; afterwards a dose of physic (*Vet. Form* 1.) should be given, he should be fed on bran mashes or green fodder for a short period, or better still, a run at grass for two or three months. A cure may thus be effected, but should a second attack occur, no man ought to risk his life or limbs by driving or riding a horse under such circumstances.

MAD STAGGERS.

(Inflammation of the Brain.—Phrenitis.)

This disorder may arise during the progress of fever, or may occur from over-feeding, or violent exertion during hot weather. The early symptoms are often overlooked; these are heaviness, a preternatural injection of the tunica conjunctiva, or lining membrane of the eyelids. The horse feels a disinclination to move, he next suddenly begins to heave at the flanks, the nostrils are expanded, there is a wild expression of countenance, furious delirium succeeds, and the animal then becomes violent and dangerous in the extreme, he plunges about the stall and is utterly unconscious of surrounding objects; worn out by fruitless struggles, he falls in a state of stupor, exhausted;—after a short time he rises and is as violent as ever. The treatment, and only treatment is, immediate and copious blood-letting—both the jugular veins should be opened at the same time, that the abstraction of blood may be as rapid as possible. It is usual to fix a ligature round the neck, that the bleeding may be effected without the necessity of standing near the horse; the bleeding must be continued regardless of quantity till the horse faints or drops. A strong dose of physic should then be given as soon as it can be administered.—Youatt recommends the Croton nut powdered *at the time*, and given *in a drink*, in the dose of half a drachm, and followed by smaller doses of ten grains each, every six hours, with plenty of injections of warm soap and water, until the bowels are well opened. If the croton is not at hand, aloes may be given, but dissolved in hot water—an ounce of aloes at the first dose, and afterwards a quarter of an ounce every four hours until purging is produced. This being effected, those medicines should be given which have a tendency to lessen the force, of the circulation, and consequently the determination to the head. The most powerful of these are the fox-glove (digitalis) and tartar emetic, in doses of a drachm each, three times a day. The head may be blistered, but rowels and setons are inadmissible. Inflammation of the brain may be confounded with colic, but, in the latter disease the animal is *always conscious*,—his countenance indicates

pain and uneasiness, he rolls about and frequently looks at his flanks—he rises and falls, but not with such violence as in inflammation of the brain.

STOMACH STAGGERS.

This disease is sometimes called *sleepy staggers* to distinguish it from mad staggers. It arises from improper, irregular, or over-feeding, and is generally the result of mismanagement, the horse may have been kept at hard work for many hours without his regular meals; he then devours ravenously every kind of food that may be presented to him, perhaps no water is given, the stomach cannot possibly digest so vast an accumulation of food,—fermentation is excited, and the stomach is distended to an alarming degree, the brain becomes sympathetically affected, and staggers are produced. The symptoms which characterize this disease are drowsiness, hanging down the head, and staggering, if the horse is disturbed, he stares vacantly around him, perhaps seizes a morsel of hay, and dozes with it in his mouth, after a short interval he drops, becomes convulsed, and dies, or delirium may supervene, when he falls, rises again, drops, becomes restive, beating himself about, and at length dies in convulsions. In the application of remedies but little can be done, much depends upon forming a correct diagnosis, but unfortunately the most experienced can seldom distinguish between the early stages of stomach staggers, and inflammation of the brain. It is, however of importance to ascertain whether the horse has had unlimited access to food of any description, or whether he has been kept long without food, the history of the case may furnish us with the means of deciding at once upon the subject, but if any doubt exists, it is better to bleed largely at the onset, it can do no harm in either case, a strong dose of physic (*Vet. Form.* 1) may next be given. In stomach staggers, however, it will be but of little avail, as the already distended state of the stomach presents an insuperable barrier to its operation, the timely application of the *stomach pump*, offers the only rational means of relief. By means of this instrument, the whole contents of the stomach may be washed out with the greatest facility, which is an object of paramount importance in cases of this kind.

TETANUS.

(Locked Jaw.)

Tetanus is one of the most formidable and fatal diseases to which the horse is liable; it is evidently an affection of the nervous system, and generally arises from punctured wounds of the foot, such as pricks in shoeing, or stepping on a nail in the road. It occasionally follows the operations of nicking, docking, cropping, gelding, &c.; it seldom happens until many days after the accident or operation has occurred, although there can be no precise limitation as to time. This disease is very insidious in its attacks, for the first day or two the horse does not feed or appear so well as usual, he partly chews his food, then drops it, he gulps his water, the motions of his jaws are evidently limited, deglutition is performed with difficulty, the saliva flows from the mouth, the muscles of the neck become stiff, the eye is drawn into its socket, occasioning squinting, the nostrils are expanded, the head raised, and nose carried forward, the legs straddle wide and the tail is erect, constantly quivering, at length the jaws become permanently fixed, in fact there is a constant spasm of all the voluntary muscles. This state of things may continue for eight or ten days, when the animal dies exhausted. Should he recover, however, the first favourable symptom is a slight and temporary relaxation of the spasm; the progress of recovery is always slow, and the animal is left in a weak condition. In the treatment the local cause should if possible be first discovered, if the injury is in the foot, caustic, or the actual cautery may be applied: if it arises from docking, the operation must be repeated higher up, if from nicking, the incision may be made deeper, and the wound dressed with digestive ointment, (*Vet. Form.* 12) The new irritation may lessen or remove the old one. Blood-letting must next be resorted to,—eight or ten quarts may be abstracted: by this means a temporary relaxation of the spasm may be induced. A dose of physic should next be given, and the best for this purpose is the croton nut, administered as directed under mad staggers. The operation of the physic should be promoted by means of clysters, of warm gruel or salt and water may be injected by means of the patent syringe, with great advantage. The whole extent of the spine should next be blistered, three or four inches wide, and then opium, in large doses, should be given; two or three drachms of powdered opium may be dissolved in a pint of gruel, or it may be made into a ball, and repeated in drachm doses every six hours. If it cannot be given by the mouth, then it must be administered in the form of injection. The horse should be well clothed, and the heat of the body may be kept up by newly stripped sheep skins put on hot. The strength should be supported by nutritive food, and if the jaws are not closely fixed, a short horn can be introduced into the mouth, and as much gruel may be administered from time to time as may be requisite. As the animal gets better, nourishing food should be given, and if the weather permits, he may be turned out for two or three hours in the course of the day.

RABIES.

(Hydrophobia Madness.)

This appears to be a disease of the nervous system, and is *quite incurable*; as soon, therefore, as it can be clearly ascertained, that the horse has been bitten by a mad dog, or any other rabid animal, the sooner it is destroyed the better. Should any doubt exist, the bite wound, or even the slightest scratch, should be well burned with lunar

caustic, the scar or scab should be removed on the third or fourth day, and the operation repeated. At the expiration of five or six months, the horse may be considered safe.

DISEASES OF THE EYE.

The eye of the horse is more frequently diseased than that of any other animal. This predisposition is certainly in many instances hereditary, in others it arises from hard riding, determination of blood to the head, from blows, bruises, and mechanical irritation. Injuries from wounds and bruises are best alleviated by poultices, bleeding, and physic. The edges of the eyelids sometimes secrete a gummy substance which produces so much itching and irritation, that the horse often injures the eye in his attempts to alleviate it;—this may be remedied by slightly rubbing the edges of the eyelid with a little nitrated ointment of quicksilver, diluted with an equal quantity of lard or spermaceti ointment. *Warts* may be taken off with a sharp pair of scissors, afterwards their roots may be touched with lunar caustic. The *haw* is sometimes thickened and inflamed;—cooling applications, bleeding, and physic, will in general remedy the evil. From neglect ulceration occasionally takes place; extirpation is the only remedy. The tunica conjunctiva, or lining membrane of the eye-lids, is frequently the subject of inflammation.—the lids are swollen and partially closed—the transparent cornea or white of the eye injected with blood,—there is an increased secretion of tears, and the eye appears dim, this may arise from catarrh or colds, blows, or mechanical irritation, the eye should be carefully examined with regard to the last source of inflammation, hay-seed, or the husks of oats may have fallen into the eye, and must be removed at the onset. A lotion applied to the eye, (*Vet. Form.* 12) and a gentle dose of physic (*Vet Form.* 1) will generally subdue this species of inflammation. Should these means fail of affording relief, and the inflammation continue unabated, we have a more formidable disease to encounter,—the genuine *opthalmia*; as the disease progresses, the cloudiness and intolerance of light increases; the complaint will run on for many weeks, sometimes better, sometimes worse,—at length perhaps the intolerance of light diminishes—the redness and opacity disappears, and with the exception of a slight thickening of the lids, all appears well again. This is a fallacious appearance;—in the course of a few weeks the attack is renewed, or the other eye becomes affected—again all is well, and again the attack is renewed. This alternation of disease and attack at length terminates in the opacity of the crystalline lens, or its capsule, and complete blindness is the result. From the periodical returns of these attacks, the disease has been called "moon-blindness." Remedies are of little avail;—it is usual to apply cooling lotions and poultices, scarifying the lining of the lid with a sharp lancet, affords immediate relief. Blood is generally abstracted from the angular vein at the inner corner of the eye, unless copious depletion is required, then the jugular vein is opened, digitalis, nitre and emetic tartar are occasionally given to lower the force of the circulation, and to subdue inflammatory action. The foul and heated air of stables powerfully predisposes to this intractable disease, as does also confinement in a dark stable. The horse is kept perhaps for many hours during the day in perfect darkness, when he is brought out and exposed suddenly to the full glare of the mid-day sun. These sudden alternations are frequently the cause of blindness, and every farmer would do well to have glazed windows in his stable, to admit a proper and due supply of light to his horses.

Cataract is an opacity of the crystalline lens, and is quite incurable.

Gutta serena is an affection of the optic nerve, and its expansion, the retina. It is commonly called "*glass eye*," and generally arises from determination of blood to the head, the pressure of which produces paralysis of the nerve, and when of long continuance, is quite incurable.

LAMPAS.

In young horses the lower bars are occasionally inflamed, and so much enlarged as to hinder the horse from eating. A few mashes, a mild dose of physic, (*Vet. Form.* 1,) or gentle alteratives (*Vet. Form.* 2) will soon remedy the inconvenience. Burning the parts with hot iron is not only unnecessary, but is cruel and barbarous in the extreme. If there is much tension and inflammation, a few slight incisions may be made across the bars by means of a lancet or penknife..

BRIDLE SORES.

Tincture of myrrh diluted with an equal quantity of water, or one ounce of alum dissolved in a pint of water, are the best applications for superficial wounds and ulcers in the mouth. If any degree of inflammation exists, a mild dose of physic (*Vet. Form.* 1) may be administered also.

STRANGLES.

Horses from three to five years of age are most liable to this disease. Old horses are occasionally attacked, and but few, perhaps none, entirely escape. This disease is usually preceded by a cough, with a copious discharge from the nostrils of a yellowish colour mixed with matter. A tumour at length appears under the jaw, which proceeds to suppuration, and bursts most frequently externally, and a great quantity of pus is discharged—the cough soon subsides, and the horse speedily recovers. The grand point in the treatment is to produce a speedy suppuration of the tumour; this is best effected by blistering the part as soon as the tumour appears—poultices and fomentations are almost useless—blistering will hasten the process by many days. As soon as fluctuation can be distinctly

felt in the tumour, it may be fully opened and the matter evacuated, and friar's balsam injected into the wound daily. A few bran mashes, a liberal supply of green food, to keep the bowels in a lax state, are generally all that is required even in severe cases. When the horse is at grass, the disease is frequently so mild as to be scarcely observable.

GLANDERS.

This is certainly the most formidable of all the diseases to which the horse is liable. It is often confounded with other diseases, and great obscurity prevails upon the subject. Mr. Youatt is unquestionably the most intelligent writer we have read upon this destructive malady, we therefore subjoin the following extracts from his invaluable Treatise on "The Horse."

"If we could obtain an authentic history of the glandered horse, we should find that, in the majority of instances, if the disease were bred in him, he had been dull, off his feed, losing flesh, and his coat staring; and that these appearances had for several weeks preceded the characteristic symptoms of glanders. These symptoms, however, may lead to, or be the causes of other diseases, or they may pass away, and the horse may return to perfect health. That which would be considered as the earliest, and an unquestionable symptom of glanders, would be an increased discharge from one or both nostrils; different from the discharge of catarrh, because it is usually lighter and clearer in its colour, and more glutinous and sticky. When rubbed between the fingers it has, even in an early stage, a peculiar, clammy, bird-limy feel. It is not discharged occasionally and in large quantities, like the mucus of catarrh, but is constantly running from the nostril.

It is a singular circumstance, for which no satisfactory account has yet been given, that when one nostril alone is attacked, it is in a great majority of cases the near or left. M. Dupuy, the director of the veterinary school at Toulouse, gives a most singular account of this. He says that out of eight hundred cases of glanders that came under his notice, only one was affected in the right nostril.

This discharge, in cases of infection, may continue, and in so slight a degree as to be scarcely perceptible, for many weeks or months before the health and capabilities of the horse seem to be injured. It will remain for a long time almost transparent, yet gluey; and then it will begin to be mingled with pus; retaining, however, its sticky character, and being rarely offensive in the early stages. The constant flow of this secretion, and its stickiness, with the absence of cough either before or during the discharge, will be the only symptoms. In process of time, however, pus mingles with the discharge, and then another and a characteristic symptom appears. Some of this is absorbed, and the neighbouring glands become affected; and, if there be discharge from both nostrils, the glands within the under jaw will be on both sides enlarged. If the discharge be from one nostril only, the swelled gland will be found on that side alone. Glanders, however, will frequently exist at an early stage without these swelled glands, and some other diseases, as catarrh, will produce them. Then we must look out for some peculiarity about these glands, and we shall readily find it. The swelling may be at first somewhat large and diffused, but the surrounding enlargement soon goes off, and one or two small distinct glands remain; and they are not in the centre of the channel, but *adhere closely to the jaw on the affected side.*

"The membrane of the nose may now be examined, and will materially guide our opinion. It will either be of a dark purplish hue, or almost of a leaden colour, or of any shade between the two; or, if there be some of the redness of inflammation, it will have a purple tinge; but there will never be the faint pink blush of health, or the intense and vivid red of usual inflammation. Spots of ulceration will probably appear on the membrane covering the cartilage of the nose—not simple sore places, or streaks of abrasion, and quite superficial, but small ulcers usually approaching to a circular form, deep, with the edges abrupt and prominent. When these appearances are observed, there can be no doubt about the matter. Care should be taken, however, to ascertain that these ulcers do actually exist, for spots of mucus adhering to the membrane have been more than once taken for them. The finger should, if possible, be passed over the supposed ulcer, to determine whether it can be wiped away; and it should be recollected also, that the orifice of the lacrymal duct, just within the nostril, and on the inner side of it, has been often mistaken for a cancerous ulcer. This orifice is on the continuation of the common skin of the muzzle which runs a little way up the nostril, while the ulcer of glanders is on the proper membrane of the nose above; and the line of separation between the two is evident on the slightest inspection.

It is proper to state that this discharge has continued unattended by any other disease, or even by ulceration of the nostril for two or three years, and yet the horse was decidedly glandered from the beginning, and capable of propagating the malady.

When ulcers on the membrane of the nose have appeared, the constitution will be evidently affected. The horse will lose flesh; his belly will be tucked up; his coat will be unthrifty, and readily come off; cough will be heard; the appetite will be impaired; the strength will fail; the discharge from the nose will grow more purulent, discoloured, bloody, stinking; the ulcers in the nose will be larger and more numerous; and, the air-passages being obstructed, a grating, choking noise will be heard at every act of breathing.

The lungs are now diseased, they are filled with tubercles or ulcerations; and the horse at length dies, an emaciated and loathsome object.

Glanders have been confounded with catarrh or cold, but the distinction between them is plain enough. Fever accompanies cold, and loss of appetite, and sore throat (the quidding of the food, and gulping of the water are sufficient indications of the latter of these); the discharge from the nose is profuse, and perhaps purulent, and the glands under the jaw, if swelled, are moveable, and there is a thickening around them, and they are tender and hot. With proper treatment the fever abates, the cough disappears; the swellings under the throat subside, and the discharge from the nose gradually ceases, or, if it remain, it is usually very different from that which characterizes glanders. In glanders, there is seldom cough of any consequence, and, generally, no cough at all.

A running from the nose, small in quantity, and from the smallness of its quantity drying about the edges of the nostril, and so presenting some appearance of stickiness, will, in a few cases, remain after severe catarrh, and especially after the influenza of spring; and these have gradually assumed the character of glanders, and more particularly when they have been accompanied by enlarged glands and ulceration in the nose. Here the aid of a judicious veterinary surgeon is indispensable; and he perhaps will experience considerable difficulty in deciding the case. One circumstance will principally guide him. No disease will run on to glanders which has not, to a considerable and palpable degree, impaired and broken down the constitution; and *every disease that does this will run on to glanders.* He will look then to the general state and condition of the horse, as well as to the situation of the glands, the nature of the discharge and character of the ulceration.

If, after all, he is in doubt, an experiment may be resorted to, which wears indeed the appearance of cruelty, and which only the safety of a valuable animal, or of a whole team, can justify: he will inoculate an ass or a horse already condemned to the hounds with the matter discharged from the nose. If the horse be glandered, the symptoms of glanders or farcy will appear in the inoculated animal in the course of a few days.

The history we have given of the symptoms of glanders will pretty clearly point out its nature. It is an affection of the membrane of the nose. Some say that it is the production of tubercles, or minute tumours in the upper cells of the nose, which may long exist undetected, and hard to be detected except by a scarcely perceptible running from the nostril, caused by the slight irritation which they occasion. These tubercles gradually become more numerous; they cluster together, suppurate, and break; and small ulcerations are formed. The ulcers discharge a poisonous matter, which is absorbed and taken up by the neighbouring glands, and which, with greater or less rapidity, vitiates the constitution of the animal, and is capable of communicating the disease to others. Other surgeons content themselves with saying that it is an inflammation of the membrane of the nose, which may assume an acute or chronic form, or in a very short time, or exceedingly slowly, run on to ulceration.

The malady proceeds as we have already described it, but, before its termination, becomes connected with farcy. Few horses die of glanders without exhibiting some appearance of farcy, and farcy, in its latter stages, is almost invariably accompanied by glanders —*they are different forms or stages of the same disease.*

Our opinion of the treatment of glanders is implied in what we have just stated. There are a few instances of the spontaneous cure of chronic glanders, or glanders long established and slow in their progress. The discharge has existed for a considerable time; at length it has gradually diminished, and has ceased without medical treatment but in the majority of these supposed cases, the matter was only pent up for a while, and then, bursting from its confinement, flowed again in double quantity: or if glanders have not reappeared, the horse, in eighteen or twenty-four months, has become farcied, or consumptive, and died. We view these cures with much suspicion but even allowing that some have occurred, they are so few and far between, that our expressed opinion of the incurable nature of the disease, in the present state of veterinary knowledge, is scarcely affected. As for medicine, there is scarcely a drug to which a fair trial has not been given, and many of them have had a temporary reputation; but they have passed away, one after the other, and are no longer used. The blue vitriol and the Spanish-fly have held out longest, and in a few cases, either nature, or these medicines, have done wonders; but, in the majority of instances, they have palpably failed. Where the life of a valuable animal is at stake, and the owner takes every precaution to prevent infection, he may subject the horse to medical treatment; but we indignantly object to the slitting of the nostril, scraping of the cartilage, searing of the gland, firing the frontal and nasal bones, and to injections of pepper, mustard, corrosive sublimate and vitriol.

Glanders is highly contagious, and no fact is more certain, than that he who will keep a glandered horse in his stable, or work him in his team, will sooner or later lose the greater part of his stud. However, the generation of the disease may certainly be much prevented, and the first and most effectual mode of prevention will be to keep the stables cool and well ventilated, for the hot and poisoned air of low and confined stables is one of the most prevalent causes of glanders.

Next to ventilation stands cleanliness; for the foul air from the fermenting litter, and

urine and dung, must not only be highly injurious to health generally, but irritate and predispose to inflammation of that delicate membrane, which is the primary seat of the disease. If to this be added regular exercise, and occasional green meat during the summer, and carrots in the winter, we shall have stated all that can be done in the way of prevention."

Connected with this subject, we may notice a peculiar discharge from the nostrils, which is often confounded with glanders, and which Mr. Youatt distinguishes by the name of

NASAL GLEET.

"The most frequent disease of this cavity is an increased and thicker discharge of fluid from the nose. It may be properly called a NASAL GLEET. There is a constant secretion of fluid to lubricate and moisten the membrane that lines the cavity of the nose, which, under catarrh or cold, is increased in quantity, and altered in appearance and consistence. This will properly belong to our account of catarrh or cold; but that to which we immediately refer is a continued and oftentimes profuse discharge when every symptom of catarrh and fever has passed away; an almost incredible quantity of thickened mucus, of different colours:—if the horse is at grass, almost as green as the food on which he lives; —or, if he be stabled, white, straw-coloured, brown, or even bloody, and sometimes evidently mingled with matter or pus; and either constantly running, or snorted out in masses many times in the day; teasing the horse, and a perfect nuisance in the stable, and o the rider. We have known this continue several months, and eventually destroy the norse.

If the discharge be not offensive to the smell, nor mixed with any matter, it is probably merely an increased and somewhat vitiated secretion from the cavities of the nose; and, all fever having disappeared, will frequently yield to small doses of blue vitriol, from one to two drachms, and given twice in the day. If fever or cough remain, a cough medicine may be combined with the tonic. If the discharge be mingled with pus, and very off ensive, the vegetable tonics, gentian and ginger, may be added to the copper in doses of two drachms of the former, and one of the latter; but there is then reason to appreh-end that the discharge will not be controlled, and will terminate in glanders. Turning into a salt marsh will occasionally effect a cure, when both the mineral and vegetable tonics have failed."

FARCY.

"FARCY is intimately connected with glanders; they will run into each other, or their symptoms will mingle together, and before either arrives at its fatal termination its associate will almost invariably appear. An animal inoculated with the matter of farcy will often be afflicted with glanders, while the matter of glanders will frequently produce farcy. They are different types or stages of the same disease. There is, however, a very material difference in their symptoms and progress, and this most important of all, that while glanders are generally incurable, farcy, in its early stage and mild form, may be successfully treated.

Veterinary writers tell us that it is a disease of the absorbents in the skin. The small arteries are employed in building up and nourishing the various parts of the body; and another set of vessels are busied in taking up and carrying away that which is worn out and useless. There is no part of the body on which thousands of these little tubes do not open. Those of the skin are not only employed in removing useless materials, but in taking up various substances, and principally fluids which may be in contact with the skin. The little vessels which are thus occupied, collect together and form larger branches, which run in company with the superficial veins, and therefore farcy was once supposed to be a disease of the veins, and the tumours by which it is characterized accompany the course of the veins. The poison which they take up produces inflammation in them, which gradually spreads along the absorbent, and causes it to swell.

The vessels, small as they are, contain valves, like those in the common pump, which permit the fluid to pass one way, but prevent its return. The inflammation, which pursues the natural course of the fluid through these tubes, that is, towards the reservoir into which it is thrown before it enters the heart, seems to be arrested by these valves, and they inflame and swell; and therefore the first indication of this disease, even before any drooping, or loss of condition, or of appetite, is generally the appearance of little tumours—*farcy buds*—close to some of the veins, following the course of the veins, and connected together by a kind of cord, which farriers call *corded veins*. When they are few and small they may possibly exist for several weeks without being observed; but at length they increase in number and in size, and become painful and hot, and some of them begin to ulcerate. They appear usually about the face or neck, or inside of the thigh, and in the latter case there is some general enlargement of the limb, and lameness.

The increase of these buds marks the progress of the disease, and that progress is retarded by the resistance of these valves. The ulcers spread around, and are cured with considerable difficulty. Larger tumours appear in the groin and between the fore-leg, and ulcerate and spread, and the hollows and burrowings run deep in every direction, and the horse becomes a miserable and loathsome object. Glanders speedily appear, and death ensues.

Few things are more unlike, or more perplexing, than the different forms which farcy assumes at different times. One of the legs, and particularly one of the hinder-legs, will suddenly swell to an enormous size. At night the horse will appear to be perfectly well, and, in the morning, one leg will be three times the size of the other, with considerable fever, and scarcely the power of moving the limb

At other times the head will be subject to this enlargement—the muzzle will particularly swell, and a stinking discharge will issue from the nose. Sometimes the horse will gradually lose flesh and strength, he will be hide-bound—mangy eruptions will appear in different parts; the legs will swell; cracks will appear at the heels, and the inexperienced person may conceive it to be a mere want of condition combined with grease.

Farcy, like glanders, springs from infection, or from bad stable management. It is produced by all the causes which give rise to glanders; but with this difference, that it is more frequently generated, and is sometimes strangely prevalent in particular districts.

The treatment of farcy varies with the form it assumes. In the button or bud farcy, a mild dose of physic should be first administered. The buds should be then carefully examined, and if any of them have broken, the budding iron, of a dull red heat, should be applied to them; or if matter should be felt in them, shewing that they are disposed to break, they should be penetrated with the iron. These wounds should be daily inspected, and if, when the slough of the cautery comes off, they look pale, and foul, and spongy, and discharge a thin matter, they should be frequently washed with a lotion, composed of a drachm of corrosive sublimate dissolved in an ounce of rectified spirit; the other buds should likewise be examined, and opened with the iron as soon as they evidently contain matter. When the wounds begin to look red, and the bottom of them is even and firm, and they discharge a thick white or yellow matter, the friar's balsam will speedily heal them. As, however, the constitution is now tainted, local applications will not be sufficient, and the disease must be attacked by internal medicines, as soon as the physic has ceased to operate. The corrosive sublimate will be the best alterative, and may be given in doses of ten grains, gradually increased to a scruple, with two drachms of gentian and one of ginger, and repeated morning and night until the ulcers disappear, unless the horse is violently purged, or the mouth becomes sore, when a dram of blue vitriol may be substituted for the corrosive sublimate. During this, the animal should be placed in a large box, with a free circulation of air; and green meat, or carrots, the latter more particularly, should be given him, with a fair allowance of corn. If he could be turned out during the day, it would be advantageous; but at all events he should be daily exercised. In an early stage of the disease, and if glanders have not appeared, this treatment will frequently succeed. If, after the wounds have healed, the absorbents should continue to be corded, a blister, or light firing, will probably be serviceable.

It should be remembered, that a horse which has experienced one attack of farcy, will be very subject to a relapse, and, therefore, should be regarded with a watchful eye, and occasional alteratives of Æthiop's mineral, with turpentine, in the proportions of one drachm of the former and four of the latter, made into a ball with linseed meal, should be given, and green meat or carrots, when circumstances will permit.

In the species of farcy attended with enormous swelling, it will be prudent to bleed moderately as well as to physic. The iron will not be necessary, but the same alterative medicine will be useful, and the leg should be frequently fomented with warm water. In both cases, although the air should be fresh and cool, the horse should be warmly clothed."

The Water Farcy, confounded by name with the common farcy, and by which much confusion has been caused and a great deal of mischief done, is a dropsical affection of the skin, either of the chest or of the limbs generally, and will be noticed hereafter.

POLL-EVIL.

Poll-evil is commonly the result of accident; small and repeated blows of the manger, or hanging back in the stall, or blows wantonly inflicted, often produce inflammation in this part, which, if not timely attended to, terminates in suppuration. The tumour should be repressed if possible by cooling applications. Vinegar and water is a good application; a gentle dose of physic, and sometimes blood-letting are necessary,—but if matter is forming, then poultices and warm fomentations will promote suppuration, and as soon as the matter can be distinctly felt, an opening should be made, and the matter evacuated, this is best effected by a seton, which should be introduced at the top of the tumour, and brought out a little *below* the abscess. A free discharge must be encouraged, the part kept clean and frequently fomented with warm water,—if these means fail to cure, a veterinary surgeon should be consulted.

FISTULOUS WITHERS.

Long continued pressure of the saddle on the withers will produce inflammation and fistulous ulceration. What has been said with respect to the treatment of Poll-evil will equally apply to Fistulous Withers.

WARBLES, SITFASTS, AND SADDLE GALLS.

Warbles are soft tumours produced by the pressure of the saddle, such frequently ulcerate and become sitfasts, as they are termed; a piece of callous skin occupies the centre of the ulcer, and cannot be separated without dissection, unless unwarrantable force is applied. Warbles may be dispelled by cooling applications; vinegar, acetate of lead, and

brine, are well known remedies, and should be frequently applied. Sitfasts may be made to separate very easily by the application of a mild blister; the wound may be dressed with Friar's Balsam, or Turner's Cerate, or both conjointly.—For saddle galls, a strong solution of salt, with a fourth part of Tincture of Myrrh, is the best application.

DISEASES OF THE CHEST.

CHEST FOUNDER.

The muscles of the chest are sometimes singularly affected. The horse experiences considerable difficulty in moving, the muscles of the breast are tender, sometimes swoln; after a short time they waste considerably, and occasionally fever arises; bleeding, physic, a rowel at the chest, stimulating embrocations, with a dose or two of antimonial powder (a drachm at a dose), warm clothing and stabling, will speedily remove this affection.

INFLAMMATION OF THE LUNGS.

Sudden alternations of temperature are the most fertile source of inflammation of the lungs. The horse, perhaps, is confined in a close stable where scarcely a breath of air is permitted to enter; clothes are heaped upon him to produce what is technically termed "a fine coat and a sleek appearance," can it be a matter of surprise, then, that an animal thus circumstanced, suddenly stripped naked and exposed to all the rigours of a winter's day, should be predisposed to inflammatory disease? In many instances, the change of temperature has been known to exceed even 30 deg. of Fahrenheit; by this sudden application of cold to the surface of the body, the insensible perspiration is checked, the lungs become embarrassed, and inflammation results. Inflammation of the lungs is sometimes very insidious in its attacks.—the horse is dull, the coat stares, he does not feed as well as usual, and the breathing is slightly quickened, at other times a hot dry cough is observed, the horse shivers, he heaves at the flanks, the extremities become much colder than other parts of the body, the pulse is small and quick, and during the progress of the disease becomes very irregular and indistinct and at length scarcely perceptible; the lining membrane of the nose and eyes are of a vivid red colour; in the latter stages of the disease the florid red assumes a livid appearance, a dusky purplish hue; the countenance is anxious and indicative of pain, the horse stands with his fore-legs wide asunder to expand the chest as far as possible, and obstinately refuses to lie down; if, however, from fatigue he is ever induced to lie down, it is but for a short period; in a moment or two he rises again, and persists in standing to the last; he reels and staggers in his stall, and at length drops, struggles, and dies.

As the future usefulness of the animal depends greatly upon the mode of treatment adopted, active means must be pursued at the onset. Bleed regardless of quantity till the pulse faulters and the horse is evidently faint; it is of essential importance that the blood be abstracted as rapidly as possible, and from a large orifice. In six hours bleed again in the same active manner, if the symptoms remain unaltered. If the heaving of the flank continues, and the legs and ears are cold, and the lining membrane of the nose still exhibits its florid redness, a third and a fourth bleeding may be necessary, but in smaller quantities, least we destroy life by exhaustion, perhaps two or three quarts will be sufficient. As soon as the blood-letting has taken effect, blister the whole of the brisket, first shave off the hair and then rub in the blistering ointment (*Vet. Form.* 12) occasionally the blister will not rise, especially if applied before the inflammation is somewhat subsided. It is a wise provision of nature, that no two violent actions of different kinds can take place at the same moment in the animal frame; it will be seen, then, that the irritation excited by the blister, produces a metastasis or transference of the inflammatory action *from* the seat of the disease within, *to* the blistered surface without. Sedative medicines may next be given, the best of these are digitalis, nitre, and tarter emetic, one drachm of each three times a day, till the pulse is decidedly affected. Purges are injurious; the rectum, however, may be emptied, and clysters administered. When a mild purgative is required, Youatt recommends eight ounces of Epsom salts dissolved in warm gruel. "No castor oil (he says) must be given. It may be a mild and safe aperient for the human being, it is a very dangerous one for the horse." The patient should be warmly clothed, but he must not be confined in a close stable; turn him into a cool box, let the doors and windows be thrown open, avoiding however drafts or currents of air. His diet should consist of *cold* mashes and green food—but not a grain of corn. The first forty-eight hours are pregnant with danger; if, after all exertions, the inflammation continues unabated, the case is nearly hopeless, the blister, however, may be repeated, the fever medicines administered more frequently, the legs rubbed and fomented with hot water. If the strength declines, drench the horse with gruel; tonic medicines may be tried, but great caution is necessary. During convalescence, the diet must still be cold mashes, green meat, thin gruel drank from the pail, with a little hay. Should the appetite fail and the horse appear weak, tonics may be tried, as chamomile and gentian, to which ginger may be added, but they must be immediately discontinued should fever arise. Of course mineral tonics are quite inadmissable."

It is not unusual for the horse to appear better,—he lies down, eats and drinks, and strong

hopes of recovery are excited, when on some powerful exertion, he falls down and dies. On opening the chest it is usual to find both cavities nearly filled with fluid.

There are many diseases the consequence of inflammation of the lungs; the first,

THICK WIND

generally arises from depositions of coagulable lymph in the substance of the lungs, occupying the place of many of the air cells, whereby the free transmission of air is prevented. It sometimes occurs without disease, as in round chested and fat horses.

BROKEN WIND.

is often the consequence of thick wind. The air passages of the lungs give way,—the air is admitted readily enough during inspiration, but it cannot be expelled as in health, during one expiration, and therefore two efforts are required, and these are scarcely sufficient to effect this purpose. Broken wind is easily distinguished from thick wind: in the latter the breathing may be thick and laborious, but the inspiration and expiration are equally so, and occupy precisely the same time; while in the former, the *inspiration* is performed by *one* effort, and the *expiration* by *two*, which is plainly to be distinguished by observing the flanks, and which occupies *double the time*. Broken wind often occurs without previous disease. Violent exercise after a full meal, or a constantly distended state of the stomach, from over-feeding, will give rise to this disorder. The farmer must have observed that many horses become broken-winded in the straw-yard. Some have come up from grass broken-winded, that went out perfectly sound;—the explanation in either case is the same, the stomach is preternaturally distended with coarse and indigestible food,—this occasions an undue pressure on the lungs—their action is necessarily limited, and during some sudden or violent exertion, the air cells give way, and the utility of the horse is impaired for ever after. Although this disease is incurable, much may be done in the way of alleviation. The food should be small in quantity, but good in quality. The quantity of oats should be increased, and hay decreased; mashes should be frequently given to keep the bowels in a gently lax state; little water should be given during the day, but at night the horse should be permitted to satisfy his thirst—he should never be rode after a full meal. Carrots are very beneficial to broken winded horses, and mangold wurzel and turnips may be given with advantage. It can scarcely be credited how much relief may be afforded by attention to the simple means here pointed out.

PLEURISY

is an inflammation of the membrane that covers the lungs. The symptoms are very analagous to those of inflammation of the lungs; the legs and ears are cold, but not so cold as in inflammation of the substance of the lungs. The lining membrane of the nose is but little reddened, and the pulse, which is the principal diagnostic symptom, is *hard and full*, not *weak and oppressed*, as when the lungs are embarrassed: there is pain and tenderness on pressure of the side, which the horse expresses by a kind of grunt: he stands in the same position, and with the same obstinacy as in inflammation of the lungs. The treatment is the same as in inflammation of the lungs with only this exception,—that aperients may be administered with more freedom, and greater safety.

CATARRH, OR COMMON COLD,

is a disorder of frequent occurrence, and if timely taken, may be subdued without difficulty. There is usually a discharge from the nose and eyes; a frequent and painful cough, with a loss of appetite,—the coat stares, and the pulse is a little accelerated. The horse should be well clothed, warm mashes given, and some nitre or antimonial powder, or tartar emetic administered. Should the cough prove obstinate and painful, then blood-letting will be necessary.

BRONCHITIS

is an inflammation of the mucous membrane of the air passages; it is characterized by a peculiar wheezing sound, which is temporarily relieved by the coughing up of mucus. Blood-letting will be rarely required in this affection. Tartar emetic, and digitalis are useful remedies. The chest should be blistered: but only in the acute forms of this disease, will bleeding be necessary.

ROARING,

for the most part arises from a deposition of coagulable lymph in the larynx or wind-pipe. Post mortem examinations have exhibited longitudinal fibres or bands, crossing the larynx in various directions. The interruption which these afford to the passage of air during the act of respiration, gives rise to those sounds peculiar to roaring horses. Sometimes roaring is occasioned by a distorted larynx, produced by tight reining, or by the injudicious practice of buckling straps tightly round the neck of crib-biters. Of course this affection is incurable when arising from previous disease, but if connected with existing inflammation of the chest, then bleeding, purging, and blisters must be had recourse to, and these remedies should be succeeded by sedative medicines, as nitre, digitalis, and emetic tartar. One circumstance, in which the breeder is most interested, must not be omitted, viz—this disease, whether originating in dam or sire, is frequently transmitted to their progeny.

CATARRHAL FEVER.

Epidemic Catarrh. Influenza. Distemper

This malady is frequently epidemic thousands of horses are attacked at the same time. It prevails in particular districts, and usually occurs in the spring or the beginning of autumn. Sometimes it is the consequence of common catarrh, but whatever may be the cause, there is great reason to believe it is infectious, and the farmer should, therefore, immediately on its appearance, separate the sick horse from the remainder of his stud. It usually commences with rigors or shiverings: the pulse is quickened, averaging from 60 to 70 pulsations in the minute; the lining membrane of the nose and eyes are red, but not of so intense a colour as in inflammation of the lungs; sometimes it assumes a livid hue, and the skin is hotter than usual; there is a discharge from the nostrils, from the very commencement, at first watery—it soon however becomes thicker, and at length mattery and offensive. There is a heaving of the flanks, accompanied with a cough, which is sometimes so painful that the horse frequently stamps with his feet, the glands of the throat and jaw are enlarged, the throat is sore, the horse refuses to eat and drink from the pain it gives him in swallowing, great debility succeeds, the horse reels, and can scarcely stand without support, and therefore leans his sides or quarters against the box,—the legs swell, and enlargements appear on the chest and belly, the cough, perhaps, becomes less frequent, the swellings diminish, the horse begins to eat, and the animal gradually recovers, but the reverse sometimes happens; the breath is offensive, the discharge from the nose is mixed with blood, the evacuations become loose, slimy, and bloody, and the animal rapidly sinks. In the treatment much judgment is required; if discovered early, bleeding will be necessary, but not in large quantities; it rarely happens that more than four quarts will be required—the intensity of fever must regulate the precise quantity. The bleeding must not be repeated unless the extremities become cold, and the membrane of the nose is becoming red; then, although debility is rapidly appearing, blood-letting will be necessary, as inflammation of the lungs is approaching. If the disease has been suffered to remain for two or three days, and the horse is quite off his feed, and fast losing his condition and strength, then bleeding must be dispensed with. Nitre, digitalis, and tartar emetic, in drachm doses, may be given three times a day. Purgatives will be necessary to empty the bowels, these may be assisted by clysters and back-raking, if the throat is very sore it should be blistered. When the fever subsides, should debility increase, a light tonic may be given, but much caution is required. Chamomiles may be tried. The horse should be warmly clothed, but the stable need not be kept so cool as in inflammation of the lungs. In supporting the strength, bran and malt mashes, with green meat and carrots will occasionally be required. If the animal refuses to eat he must be drenched with thick gruel, but if water is refused him entirely, he will drink sufficiently of thin gruel to afford him necessary support.

"The disease," says Mr. Youatt, "with which catarrhal fever is most likely to be confounded, is inflammation of the lungs, and as the treatment of the two is in some particulars so different, the farmer should be enabled readily to distinguish between them. If a little care be used, this will not be difficult; the febrile character of the pulse, the early discharge from the nose, the want of intense redness in the lining of the nose, the frequent and painful cough, the enlargement of the glands and soreness of the throat, the rapid loss of strength, the sometimes constant, at others variable warmth of the legs. The fidgettings and pawing will sufficiently distinguish catarrhal fever from the oppressed pulse, red nostril, heaving flank, little cough, fixedness of limbs, and coldness of the extremities, which accompany and characterize inflammation of the lungs."

MALIGNANT EPIDEMIC, MURRAIN, OR PEST.

This is a highly contagious and fatal malady. The prostration of strength is rapid in the extreme, the throat is intensely sore and the mouth ulcerated, the breath is stinky, and a fœtid bloody discharge issues from the nostrils; the pulse is rapid, small, and weak, and the animal refuses food of every kind that may be offered him,—gangrene rapidly succeeds and death speedily follows With respect to treatment, so little can be effected, that unless the horse is very valuable it will be better to destroy him at once than run the risk of spreading so fatal a disease

CHRONIC COUGH

Is generally the result of inflammation; it sometimes arises from worms, in which case a few worm balls will afford relief. If it proceeds from irritation in the air passages sedative medicines, in diminished doses, may be given every night, and persevered in for some time. (*Vet. Form.* 5.) Blistering the throat has sometimes proved beneficial. It not unfrequently happens that all remedies are ineffectual; and if the cough is slight, and the general health of the animal unimpaired, it will be useless to persevere in remedies if they do not prove speedily beneficial If the cough occurs immediately after drinking, or as soon as the horse leaves the stable, it probably proceeds from irritation in the air passages; if after eating, the substance of the lungs is affected, in either case the horse cannot legally be warranted sound. This form of cough is much aggravated by improper feeding. Two much dry meat must be avoided, chaff is improper, and if the horse is allowed to eat its litter matters will be still worse; green meat in the spring is often beneficial, and carrots are decidedly useful.

DISEASES OF THE ABDOMEN.

INFLAMMATION OF THE BOWELS

is most frequently induced by alternations of temperature; sudden exposure to cold, excessive riding, drinking cold water when heated, bad food, and improper clothing. Neglected Colic also frequently terminates in inflammation of the bowels; these diseases, are often confounded the one with the other, but it is of vital importance to be able to discriminate between the two; the symptoms in some respects resemble each other, but the treatment is very different; a slight mistake and the consequences may be fatal. It will be seen, then, how important it is to be able to form a correct diagnosis, for that alone must guide us in the application of our remedies; fortunately, however, this is not a difficult task, and the following table, containing the characteristic symptoms of each disease, will enable the attentive observer readily to distinguish between them:—

Colic.	*Inflammation of the Bowels.*
1. Pulse natural during the intervals of ease, rarely quicker although somewhat fuller.	1. Pulse rapid, weak, and small, sometimes scarcely perceptible.
2. The attack comes on suddenly, is never preceded and seldom accompanied by fever.	2. The attack gradual in its approach, and preceded by fever.
3. The horse lies down and rolls upon his back.	3. He lies down, then suddenly rises up again, *seldom* rolling upon his back.
4. The legs and ears of the natural temperature.	4 Legs and ears cold.
5. Pain relieved by motion, as also by rubbing the belly.	5. Pain aggravated by motion, belly exceedingly tender, which is increased by pressure.
6. Intervals of ease.	6. Pain constant.
7. Strength scarcely affected.	7. Great prostration of strength.

In addition to the symptoms already enumerated as indicative of inflammation of the bowels, we may notice hurried respiration, constipation of the bowels, increased redness of the lining membrane of the eyes and nostrils, and preternatural heat of the mouth. The poor animal also expresses his pain by frequent pawing and striking at his belly, at the same time he looks anxiously at his flanks, and utters a groan.

The treatment must be prompt and decisive, blood-letting is our sheet anchor here. Bleed until the pain is removed, and the animal shews indications of approaching faintness, we must not be deterred by the seeming weakness of the pulse, it is not the pulse of debility we have to contend with here, but of inflammation intense in its character and fatal in its consequences,—we must bleed then, regardless of quantity, the *effect* alone influencing our decision. After bleeding it is usual to administer clysters, but purgative medicines are quite inadmissable. Every veterinary surgeon is aware of the impropriety of giving active purgative medicine, but none appear to account for the injurious consequences which its administration induces, the human practitioner, however, readily solves the difficulty,—he knows that the constipation is the *effect* and not the *cause* of inflammation; he knows too, that the proper peristaltic action of the intestinal canal cannot be carried on while intense inflammatory action is existing there, and that to administer strong purgative medicines under such circumstances would be only adding fuel to the fire; they may induce irritation, but cannot subdue the inflammation. How then does he proceed? He bleeds, regardless of quantity, till the pain is relieved, or approaching syncope induced, he next administers a full dose of opium, not so much with the view of alleviating pain as with the hope of arresting *hæmorrhagic re-action*, for his experience teaches him that although he may have succeeded in subduing the heart's action, yet unless he adopts measures to prevent its re-action, he may still have to contend with an inflammation renewed under circumstances the most unfavourable; happily, however, modern practice points out the means by which this object may be safely effected, and opium is now fearlessly administered in cases and under circumstances, in which but a few years ago its exhibition would have been deemed an act of the grossest ignorance, and pregnant with the greatest danger. It is really astonishing to witness in cases accompanied by the most excruciating tortures to which the human frame is liable, the almost instantaneous relief afforded by the free use of the lancet, and the prompt exhibition of opium. How far a similar practice may avail the veterinary surgeon experience must alone decide, but analogy induces us to believe that it will be

found equally instrumental in alleviating the sufferings of the horse as of man. Should our suggestion be acted upon, it will be remembered that after copious depletion a *full* dose of opium must be given; a dose at least three times as large as is usually administered will be necessary to produce the desired effect.

In reverting to the general practice in these cases, it will be necessary to promote the operation of the clysters by back-raking; large quantities of fluid may be injected by means of the stomach pump, or Read's patent syringe. As soon as the inflammation is somewhat subsided, the action of the clysters may be promoted by encouraging the horse to drink plentifully of warm water or thin gruel, and two drachms of aloes dissolved in gruel may be given every six hours until the bowels have been freely acted upon. The belly should be blistered, the legs well bandaged, the horse warmly clothed, and the air of the stable kept cool. The diet may be bran mashes and green meat, but neither hay or corn must be given; as the horse recovers, two or three handfulls of corn may be given during the day, clysters occasionally administered, and the legs well rubbed with the hands. Our observations on the treatment of inflammation of the peritoneal coat of the intestines have already extended to a greater length than we intended, but there is another affection of the bowels in which the mucous structure is the seat of inflammation, which must not pass unnoticed. Here the bowels are not constipated, on the contrary, the purging is violent, the breathing hurried, the legs and ears *warm*, the pulse quick and small, but not so small as in inflammation of the peritoneal coat. Unless the symptoms are very urgent, thin gruel may be copiously given. Corn, hay, and green meat, must however be sedulously avoided; astringents are scarcely necessary unless the purging continues violent, when it will be necessary to administer astringent draughts every six hours, till the irritation is lessened, (*Vet. Form.* 7). Scouring is frequently induced by a too liberal supply of green food, and horses hard worked upon such food will often scour; change of diet or less labour will remedy the inconvenience.

SPASMODIC COLIC.

In addition to the diagnostic symptoms given above, we may notice the following from "The Horse:"—The attack of colic is usually very sudden; there is often not the slightest warning. The horse begins to shift his posture, looks round at his flanks, paws violently, strikes his belly with his feet, lies down, rolls, and that frequently, on his back. In a few minutes the pain seems to cease, the horse shakes himself and begins to feed; but on a sudden the spasm returns more violently, every indication of pain is increased, he heaves at the flanks, breaks out into profuse perspiration, and throws himself more violently about. In the space of an hour or two, either the spasms begin to relax, and the remissions are of longer duration, or the torture is augmented at every paroxysm, the intervals of ease are fewer and less marked, and inflammation and death supervene."

The drinking of cold water when the animal is heated, is one of the most frequent causes of colic. Excess of green food, sudden exposure to cold, are also occasional causes of gripes. In the treatment of colic it is, as we have before observed, of the utmost importance to distinguish between this disease and inflammation of the bowels; if *any doubt exists*, it is better to bleed at once than risk the life of a valuable animal; in genuine colic, antispasmodic medicines often afford immediate relief; the best for this purpose are oil of turpentine and tincture of opium; three ounces of the former and one of the latter may be given in a pint of warm ale,—if relief is not speedily obtained, half of the above dose may be repeated, with the addition of one ounce of Barbadoes aloes dissolved in warm water. The horse should be moved briskly about, and the belly rubbed with a warm cloth or brushes. Clysters should be frequently administered, and as soon as relief has been obtained, the clothing of the horse wet with perspiration should be removed and warm dry clothing substituted. It will be advisable to give nothing but bran mashes and luke-warm water for a few days after the attack, when a more substantial diet may be commenced with.

WORMS

Are frequently sources of annoyance to the horse, they are of two kinds, the long white worm (*Lumbricus teres*), and the small thread worm (*Ascaris*): the former are best removed by a dose of physic. Mr. Youatt objects to the indiscriminate use of calomel in these cases, as a vermifuge he considers it inert, and in preference recommends two drachms of tartar emetic, with a scruple of ginger, to be made into a ball with linseed meal and treacle, given every morning half an hour before the horse is fed. For thread worms, an injection of a quart of linseed oil, or an ounce of aloes dissolved in warm water, will be found more efficacious than strong doses of purgative medicines.

JAUNDICE.

(*Yellows.*)

Jaundice arises from an absorption of bile taken up into the circulation, occasioned by some obstruction in the gall ducts, an increased flow or vitiated state of the bile; or sometimes, although very rarely, an inflammation of the liver itself. This disease is not of frequent occurrence, the horse having no gall-bladder, the bile as it is separated from the blood, passes at once from the liver through the gall duct into the duodenum or first small intestine, and from this simplicity of arrangement obstructions seldom occur. The symptoms that characterize this affection are so obvious that there can be no difficulty in

recognising it. The eyes, mouth, and skin, assume a yellow colour; the dung is scanty, pale, and hard; the appetite impaired, and the animal very languid. Should there be the least indication of inflammatory action, bleeding must be immediately had recourse to. The bowels must be freely opened by *mild* and repeated doses of alterative medicines, (*Vet. Form.* 2), and the horse allowed plenty of water slightly warmed. Green food and carrots may be freely given, and the animal warmly clothed. Subsequently a few tonic balls may be administered with advantage, (*Vet. Form.* 6.)

INFLAMMATION OF THE KIDNEY.

As a common source of this disease, we may notice the too frequent use of diuretic balls; these are useful remedies when properly administered, but their indiscriminate employment cannot be too much deprecated. The farmer, probably, may not be aware that *hay* that has been *mow-burnt*, as also *musty oats*, act as diuretics, and that their long-continued use often terminates in inflammation of the kidney; the knowledge of this fact, therefore, ought to put him on his guard, and make him careful to select food of the best quality only for his horses. Blows on the loins, and long exposure to cold and rain, must also be noticed as occasional sources of this affection. The symptoms, which are as follows, may be briefly enumerated—fever, pulse quick, hard, and full, in the early stages of this disease; but subsequently rapid, small, and sharp. There is an evident increase of temperature over the regions of the part affected, and the animal shrinks when pressure is applied there. The urine is small in quantity and voided with pain and difficulty, it is always high coloured and often bloody, and frequently entirely suppressed. The horse stands with his hind legs wide apart, and strains violently in painful and ineffectual efforts to urinate. Symptoms somewhat similar occur when the neck of the bladder is the seat of inflammation, and as it is of the utmost importance to distinguish between the two affections, it will be advisable to introduce the hand up the rectum. If the bladder is found empty, and there is an increased heat and tenderness in that part of the intestine situated immediately over the bladder, we may be *certain* that the *kidney* is the seat of disease; but, on the other hand, if the bladder is felt hard, full, and distended under the rectum, *then* the *bladder* is the organ affected. In the treatment blood-letting must be carried to its fullest extent, an active purgative, (*Vet. Form.* 1,) should next be administered, and the loins fomented with hot water. Counter irritation should be excited over the seat of pain, but *not* by means of a blister or turpentine; (*the lotion Vet. Form.* 10.) or a mustard poultice may be applied. Diuretics are quite inadmissable, their administration will only tend to *renew* or *increase* the inflammation. Many valuable horses have been destroyed by the ignorant and injudicious administration of diuretic balls. The horse should be warmly clothed, his legs bandaged, and above all encouraged to *drink copiously* of warm thin gruel.

INFLAMMATION OF THE BLADDER AND OF THE NECK OF THE BLADDER.

Calculus, a stone in the bladder, or irritant matter in the urine, will occasionally produce inflammation of the bladder; the symptoms are very similar to those of inflammation of the kidney, and the treatment is the same. The neck of the bladder, however, is more frequently the seat of inflammation, and here also as in inflammation of the kidney the urine is voided with pain and difficulty, and in small quantities at a time. It is easily detected by introducing the hand into the rectum, when the bladder will be found full, hard, and distended; it must always be borne in mind that this is a case of simple *retention*, and not *suppression* of the urine. The kidneys secrete the urine, from whence it is conveyed into the bladder by means of a small tube called the ureter, where it is deposited until from its accumulation, or the will of the animal, the bladder contracts and expels its contents. Were it not for this wise provision, the urine would dribble away as fast as secreted, to the constant annoyance and inconvenience of the animal. It will be easily conceived how improper it must be then to administer diuretic medicines under these circumstances. It is evident there is no deficiency of urine, it is secreted in the kidneys as heretofore, and conveyed from thence into the bladder, from which it cannot possibly make its escape in consequence of the spasmodic action of the neck of the bladder, induced by its inflammation. How then is this spasm to to be subdued? Bleed largely or until the horse appears faint, purgatives and clysters must next be administered, and if these means fail in affording relief, then one drachm of opium must be given every two or three hours until relief is obtained; an active blister may be applied externally, and sometimes it will be necessary to evacuate the contents of the bladder by means of a catheter skilfully applied. The horse should be encouraged to drink copiously of warm thin gruel, for which purpose it will be advisable to offer it him frequently.

DIABETES

or profuse staling is a very uncommon disease, it appears to be occasioned by the improper use of strong diuretics, bad food, and occasionally as the result of inflammation of the kidney. The treatment is both obscure and uncertain, and in these cases it is always best to consult some skilful veterinarian.

DISEASES OF THE EXTREMITIES.

SPRAIN OF THE SHOULDER.

This affection is not of such frequent occurrence as is generally imagined, but sometimes the difficulty of ascertaining the real seat of lameness, when situated in the foot, has occasioned many an ignorant smith to refer the complaint to the shoulder, and the poor animal has, in consequence, been doomed to undergo the painful operations of pegging, blistering, swimming, and firing. It is of considerable importance, therefore, to be able to distinguish sprains of the shoulder from other injuries. Mistakes will seldom occur if attention be paid to the following symptoms.—The horse drags his toe along the ground from inability in the muscles of the shoulder to lift his foot from the ground, if he lifts his foot high, the shoulder cannot be much affected—motion gives extreme pain, and the animal is unable to sustain any weight on the affected limb, he therefore rests on the toe alone, but if urged to walk, and especially down hill, he catches up the limb with considerable quickness. On taking up the foot and bending the leg that it may be brought considerably forward, the animal evinces great pain, which he will not do if the foot is the seat of injury. In severe sprains, there will be heat and tenderness of the muscles situated within the arm, close to the chest. Bleeding from the plate vein,—the administration of a laxative or purgative, as the case may require,—hot fomentations, assiduously applied, with absolute rest and quietude, generally effect a cure. Occasional blistering will be necessary.

SPRAIN OF THE WHIRL-BONE (HIP JOINT).

Injuries of this kind are frequently brought on by negligence in riding or driving, and sometimes from a sudden slip of the animal's hind feet on a bad road or pavement, whereby he is thrown upon his side. Warm fomentations, evaporating lotions, with rest, and in some cases physic, mercurial frictions and blistering, are the means best adapted for the cure of this affection.

SPRAIN OF THE STIFFLE,

must be treated in the same manner as a sprain of the whirl-bone.

SPRAIN OF THE COFFIN-JOINT,

is indicated when the lameness is sudden, and when at the same time there is heat and tenderness round the coronet. This affection is frequently confounded with shoulder lameness by grooms and smiths because when unable to trace the lameness to the foot, they think, as a matter of course, that the shoulder must be affected. Severe sprains of the coffin joint are always serious in their consequences, as there is a constant liability to a return of the complaint, and ultimately the disorganization of the foot. Bleeding at the toe, rest, fomentations, physic, and blisters, are the means usually resorted to for the removal of this affection

SPRAIN OF THE FETLOCK.

The symptoms of this injury are similar to those of sprains in the back sinews. The fetlock-joint appears swoln and inflamed, attended by lameness. In slight cases, fomentations and rest will effect a cure, but in severe cases, bleeding, purging, and blistering will be necessary.

SPRAIN OF THE BACK SINEWS.

This accident may happen either in the fore or hind legs, and may arise from a simple extension of the tendons, or what is more frequently the case, an inflammation of the sheath which encloses them. Coagulable lymph is deposited between the sheath and tendons, which becoming organized, unites or glues them together; thus, every motion gives the animal extreme pain. The lameness is exessive, and the heat and swelling of the parts clearly indicate the seat of the disease. When the injury is great, the animal should be bled at the toe, but not "in the usual farrier's way," says Youatt, "of first paring down the sole, and then taking out a piece of it at the toe of the frog, in which case a wound is made often difficult to heal, and through which fungous granulations, from the sensible parts beneath, will obstinately spring; but after the sole has been well thinned, let a groove be cut with the rounded head of a small drawing knife, at the junction of the sole and the crust. The large vein at the toe will thus be opened, or the groove may be widened backward until it be found. When the blood begins to appear, the vein may be more freely opened by a small lancet thrown horizontally under the sole, and almost any quantity of blood may be easily procured. The immersion of the foot in warm water will cause the blood to flow more rapidly. When a sufficient quantity has been drawn, a bit of tow may be placed in the groove, and the shoe tacked on. The bleeding will be immediately stopped, and the wound will readily heal." After bleeding a dose of physic should be given, and the leg well fomented with hot water three or four times a day, and between the fomentations, poultices of bran or oatmeal, in which the saturnine lotion has been introduced, must be applied. *No hot oils or stimulating lotions* must be employed, they often effect serious mischief, and certainly increase and aggravate the injury. As soon as the inflammation has subsided, the leg should be bandaged with a flannel roller, which should be frequently wet with an evaporating lotion, (*Vet. Form.* 10.) The horse should have bran mashes or green meat, and be kept at rest two or three weeks, when if all inflammation has subsided, he may be gently exercised, and gradually put to work.

In severe cases, however, it often happens that the lameness continues after the inflammation has been subdued, in these cases the leg must be blistered, and the horse allowed a run at grass for two or three months. If from bad management the part become callous, and the horse continue lame, then nothing short of the actual cautery, will rouse the absorbents into action. The firing should be applied in straight lines, after which the animal should be allowed six or eight months run at grass. It is customary to blister immediately after firing: this is decidedly wrong and cruel. If, in six or eight weeks after the operation, the lameness continues, then blistering may be properly and advantageously employed.

BREAKING DOWN OR RUPTURE OF THE SUSPENSORY LIGAMENT AND BACK SINEW, OR FLEXOR TENDONS.

The rupture of the flexor tendons of the foot, is not at all so common an accident as that of the ligament, although often mistaken for the latter. Nothing, but the most powerful force could accomplish a rupture of these tendons. Both accidents are termed "*breaking down.*" Very little can be effected in the way of cure; the inflammation should be moderated by the means already pointed out, and the heel should be raised. Bandaging and firing, after the inflammation has subsided, are the means usually resorted to for patching up the animal for sale, but a permanent cure can never be effected.

WIND GALLS.

The term wind gall is popularly given to swellings situated on the joints, and which are enlargements of the *bursæ muscosæ*, or mucous bags with which every joint is furnished to contain a lubricating oil. These enlargements are termed, according to their situation, bog spavin, thorough pin, capulet or capped hock, wind galls of the knee joint and of the elbow. A slight wind gall will scarcely require treatment; but when they are so large as to impede the motion of the limb, then bandaging will be required, and a lotion applied, (*Vet. Form.* 10.) These means, with rest, will often diminish the size of the swellings, but they are very liable to return under hard work. Blisters are very serviceable; but in bad cases, firing offers the only means of affording permanent relief. The old farriers supposed these enlargements to contain wind, and hence they frequently punctured them;—inflammation was frequently the consequence, and many a valuable horse has been destroyed by this absurd practice.

BLOOD SPAVIN, BOG SPAVIN, CAPULET, THOROUGHPIN,

Are all of them originally of the nature of windgalls, and are nothing more than enlargements of the bursal capsules, which by over exertion and hard work become distended, constituting puffy swellings, called *bog spavin* when situated on the inner part of the hock. The pressure which this induces sometimes occasions a varicose state of the superficial vein, which passes directly over it on the inner side of the hock, and which enlargement then receives the name of *blood spavin.* When the bursal enlargement extends through the hock it is called *thoroughpin.* When situated on the point of the hock it is then termed *capulet* or *capped hock.* If any treatment is necessary, a similar practice to that recommended under wind galls must be resorted to.

CURB

Is an inflammation of the ligaments at the back of the hock. Should this affection be observed in its early stages, those applications which are recommended in sprains of the back sinew will generally effect a cure; but in curbs of long duration, blistering and sometimes firing, will be absolutely necessary.

SWELLINGS OF THE ELBOWS AND KNEES.

The elbows are frequently affected by swellings occasioned by the calkins of the shoes injuring this part when the horse sleeps with his forelegs doubled under him. A seton passed through the tumour will frequently cause its disappearance, or otherwise it may be dissected out with safety.

SPLINT.

Hard excresences which form on the shank bone of the horse are termed *splints;* they vary in size and shape, and are sometimes so large as to press against the back sinew, causing stiffness and in some instances decided lameness. When the splint is forming the horse is frequently lame, the periosteum or membrane covering the bone is painfully stretched; but when the membrane has accommodated itself to the tumour the lameness subsides, unless the splint is so situated as to interfere with some tendon or ligament, and then lameness is frequently induced. In most cases it will be scarcely deemed necessary to interfere, but if any treatment is thought advisable, the hair should be shaved off close to the tumour, and some strong mercurial ointment rubbed in; after two or three days this application may be succeeded by a strong blister, (*Vet. Form.* 12.) which may be repeated after a short interval if deemed necessary. It occasionally happens that all our applications are useless, but even in these cases, nature at no distant period frequently effects a cure, and the tumour totally disappears.

BONE SPAVIN

Is a hard tumour or bony excresence situated on the inside of the hock; it sometimes occurs on the lower part of the hock, at others it is more deeply seated. This disease is far more intractable than the affection last described, the same remedies must be employed and persevered in. Sometimes firing is necessary.

RING BONE

is of the same nature as bog spavin, being an exostosis or bony circle formed round the coronet, it cannot be cured, but may be relieved by the means already alluded to. Ring bone is one of the most serious lamenesses to which the horse is liable, and constitutes unsoundness when existing in the slightest degree.

BROKEN KNEES.

The treatment of broken knees is, as Youatt justly remarks, "a subject of considerable importance, for many horses are sadly blemished, and others are destroyed by wounds in the knee joint. The horse, when falling, naturally throws his knees forward, these receive all his weight, and are sometimes very extensively lacerated. The first thing to be done is, by very careful washing with warm water, to cleanse the wound from all gravel and dirt. It must then be ascertained whether the joint is penetrated. The grating of the probe on one of the bones of the knee, or the depth to which the probe enters the wound will often too plainly indicate that the joint has been opened. Should any doubt exist, let a linseed-meal poultice be applied. This will at least act as a fomentation to the wound, and will prevent or abate inflammation; and when, twelve hours afterwards it is taken off, the *synovia or joint oil*, in the form of a glary yellowish transparent fluid, will be seen, if the capsular ligament has been penetrated. Should doubt remain after the first poultice apply a second. The opening of the joint being ascertained, the first and immediate care is to close the orifice; the manner of effecting this must be left to the judgment of the veterinary surgeon, who alone is capable of properly treating such a case. It may be effected by a compress enclosing the whole of the wound, and not to be removed for many days; or it may be attempted by the old and generally successful method of applying the hot iron over the wound, and particularly over the spot where the ligament appears to be lacerated. A poultice may then be applied to the part, and the case treated as a common wound. Should the joint oil continue to flow, the iron may be applied a second, or even a third time. By the application of the iron, so much swelling is produced on the immediate puncture, and in the neighbouring parts, as mechanically to close and plug up the orifice.

If, however, the opening into the joint be extensive, and the joint oil continues to flow and the horse is evidently suffering much pain, humanity will dictate that he should be destroyed. The case is hopeless. A high degree of fever will ere long carry the animal off, or the inflammation will cause a deposit of matter in the cavity of the joint which will produce incurable lameness.

The pain caused by the iron is doubtless great; it is, however, necessary: but let no reader of this article permit the torturing experiments of the farrier to be tried, who will frequently *inject* stimulating fluids, and even oil of vitriol, into one of the most sensible and irritable cavities in the whole frame.

When the skin has been lacerated, although the wound may be healed, some blemish will remain. The extent of this blemish will depend on the extent and nature of the treatment which has been adopted. Every caustic application will destroy more of the skin and leave a larger mark. Should the blemish be considerable, a mild blister may be applied over the part after the wound has healed. It will stimulate the hair to grow more rapidly and thickly round the scar, and particularly hair of the natural colour, and by contracting the skin it will lessen the scar itself.

In examining a horse for purchase, the knees are very strictly scrutinized. A blemish on them should not induce us at once to condemn the animal; for a bad rider, or the merest accident, may throw the safest horse. A broken knee, however, is a suspicious circumstance, and calls for the most careful observation of the make and action of the horse. If it be accompanied by a thick and upright shoulder, and legs far under the horse, and low slovenly action, he his unwise who does not take the hint: this faulty conformation has produced its natural consequence;—but, if the shoulder be oblique, and the withers high, and the fore-arm strong, the good judge will not reject the animal because he may have been accidentally thrown."

DISEASES OF THE FEET.

NAVICULAR DISEASE.

(*Founder.—Contraction or Fever in the Feet.—Pumiced Foot.—Grogginess.*)

All these affections are now embraced under the term navicular disease, although there is still a discrepancy of opinion among the most talented men in the veterinary profession, as to the cause of contraction of the feet and the many affections arising from this source. Mr. Dick, an intelligent veterinary surgeon, ranks among the *predisposing causes*, "all the *gradual* effects produced by shoeing, improper paring, the artificial treatment in the stable, heat of litter, want of stopping, and confinement in the stall; also a peculiar formation of the limbs. Among the *exciting* causes may be noticed continued pressure or contraction of the whole or any part of the foot, bruises, strain of the tendons, and violent over exertion. With regard to the symptoms in the early stage of the disease, there is a peculiar shifting of the feet, and shortness of step, and a degree of heat is found in the foot, more especially about the heels and coronet, in the stable the horse is always pointing or holding the foot in a relaxed position, there is a dryness of the hoof, throbbing of the pastern arteries and pain on pressure in the hollow of the pastern. The other parts

are clean and flue. There is a general tenderness of the foot on pressure, he trips and stumbles; the foot is contracted; the muscles of the shoulder wasted, and he is then a confirmed grogg.

With respect to treatment, if once the navicular bone has become ulcerated, and adhesion has taken place between it and the tendons, or if even ossific particles have been deposited on the articular cartilage, all efforts to effect a radical cure will be futile and useless." It is only in the early stages of the disease that a cure can be effected,—rest, topical bleeding, purging, poultices, blisters, and firing, are the means usually resorted to for this purpose. These means failing of affording relief, the poor animal is sometimes doomed to undergo the operation of *unnerving*, which consists in making an incision through the integuments at or below the fetlock, on each side of the legs, and having exposed the nerves going to the foot, they are first divided, and a portion about an inch or upwards in length is dissected out; but as this operation can only be performed by a person acquainted with the anatomy of the horse, it will be useless to describe the steps of the operation. By this process of unnerving, the foot is deprived of its nervous energy and feeling, by which the animal, unconscious of the existence of disease or pain in his feet, goes on doing his work, in many instances, for a considerable number of years with apparent ease and freedom, but it must not be disregarded that in many instances unpleasant effects speedily follow. In consequence of depriving the foot of sensation, the animal is unable to distinguish whether he treads upon an even or an uneven surface, whether he has picked up a stone, been wounded in shoeing, or his foot bruised by the tightness of the shoe; the consequence of which is, that suppuration frequently follows these injuries, and, as the animal is still unconscious of what is going on in his foot, he continues to use it until the suppurative process has spread over the whole foot, and the hoof is detached.

SAND CRACKS.

Sand cracks are fissures or cracks in the hoof, for the most part situated on the inside quarter of the fore foot, but often on the front of it down to the toe, and occasionally on the outside near the heel. Sometimes it appears in the front of the hind foot. From these cracks blood or moisture oozes, and the sensible part of the hoof protruding between these fissures when pressed upon excite pain and cause lameness. The crack or cleft should, in the first instance, be opened with a drawing knife, and all the hollow portions of the horn thoroughly cut out; a transverse incision across the upper part of the crack should be made, and a solution of blue vitriol applied to the granulations. The wound should be filled with a pledget of tow and the tar ointment, and the hoof bound tightly round with list. These measures generally effect a cure; should they fail, firing may be resorted to with every prospect of success.

Should the sand crack be neglected, and the horse continued in work, the probable consequence will be, an entire disunion of the part, the cleft of the hoof remaining, constituting the irremediable defect and weakness of a FALSE QUARTER.

QUITTOR.

This disease is characterised by a round lump or excresence situated on the coronet chiefly of the fore feet, between the hair and hoof, and most frequently on the inside quarter of the foot. This affection is often induced by a severe tread, which the horse accidentally inflicts upon itself in its endeavours to avoid falling upon its side during slippery or frosty weather. Punctures, the extravasated matter of a bruise or corn, are alike causes of this inveterate, and, in severe cases, hopeless disease.

The usual practice of introducing caustics into the sinuses "*to bring out a core*," as it is termed, is highly deprecated by Mr. Newport, who adopts the following simple and effectual mode of treatment, (*Veterinarian*, vol. 1.) "After the shoe has been removed, thin the sole until it will yield to the pressure of the thumb, then cut the under part of the wall in an oblique direction from the heel to the anterior part, immediately under the seat of complaint, and only as far as it extends, and rasp the sides of the wall thin enough to give way to the pressure of the over distended parts, and put on a bar-shoe, rather elevated from the frog. Ascertain with a probe the direction of the sinusses, and introduce into them a saturated solution of sulphate of zinc, with a common syringe that will hold from one drachm and a half to two drachms of the liquid. Place over this a dressing of the common cataplasm, or Ung. Terebinth. and renew the application every twenty-four hours. I have frequently found that three or four such applications will complete a cure. I should recommend, that when the probe is introduced to ascertain the progress of the cure, it be gently and carefully used, as it may break down the new forming lymph. I have found the solution very valuable where the synovial fluid has escaped; but it must not be used if the inflammation of the parts be great."

TREADS, OVER-REACHING.

The coronet is sometimes wounded from one foot being placed on the other, or from the peculiar conformation of the hind quarters. The horse over-reaches and wounds his fore heels with the toes of his hind feet; the latter is a very serious defect in a horse. The injury the animal may sustain from either of the above causes, must be treated on the common principle that all wounds and bruises are managed.

CUTTING

Is a defect to which many horses are liable; it may arise from defective form, in some horses the toes will point outwards, in others inwards; weak as well as young horses when fatigued are apt to cut. Some horses cut by the edge of the shoe, others by the hoof at the quarters, and some by the point of the heels. When the horse strikes the shank high up it is called *speedy cut*, and is hence remedied by wearing knee boots or rollers. When it is at the fetlock, the cutting occurs more frequently at the sides; sometimes, however, the injury is farther behind. The most successful remedy is to put on a shoe of *even thickness throughout*, the bearing must be *perfectly level*, and only *one nail* must be driven on the inner side of the shoe, and that near the toe; the crust should be rasped a little at the quarters, and care taken that the inside of the shoe does not extend beyond the edge of the crust.

CORNS.

Thousands of horses are ruined by this troublesome affection, in most cases brought on by carelessness or ignorance of the smith in shoeing horses; sometimes, however, they are occasioned by gravel or dirt insinuating themselves between the shoe and the horny heel. It is undue pressure, therefore, which is the cause of this ailment, the horse in its natural state being never subject to this affection. From the pressure the fleshy sole itself is bruised, from which a speck of extravasated blood follows, and if not immediately relieved suppuration takes place, and the most serious consequences result. Sometimes the part becomes habitually defective, and instead of forming healthy horn, it always afterwards forms a spongy substance of extreme sensibility, and thus is always liable to produce pain and lameness when subjected to pressure. Deceived by the name, the smiths, (observes Hinds), from the resemblance of this affection to the hard excresence called a corn on the human foot, proceed at once to " pare the corn out to the quick, *till the blood starts*;" they then heedlessly put on the same shoe upon the same thick heel and hard hoof which first brought about the malady, and the lameness returns. Let the heel of the shoe be cut off on the side that is afflicted, or if both sides have corns, a bar shoe is recommended as giving pressure to the frog. The heels are then to be rasped away free from any contact with the shoe; if they are thick and hard this will give them play—if thin and tender they will thus be free from pressure.

" The *thick heel* is most commonly affected, and should be softened by an extensive poultice that is to cover the whole foot, after the corn as been pared and treated with butter of antimony. Tar is then a very desirable application, or Friar's balsam, and if inflammation is again discovered, poultice the foot once more. Fire is applied by some, but the hoof is permanently injured by the actual cautery, and whatever good is atchieved is thus counterbalanced by the evil."

THRUSH.

The thrush is always the result of filth and negligence, although contraction of the heels and bruises will occasionally produce it, tenderness at the cleft of the fore foot, accompanied by a sharp, quick, and irregular pulse, are the earliest symptoms of this affection. The frog at length becomes ulcerated, and a fœtid discharge issues from the cleft or division. If detected in its early stage, purgative medicines and a cooling regimen will generally subdue it; but when the frog is evidently affected, all the diseased parts must be cut away, and the sore washed with a solution of blue vitriol, after which the astringent ointment, (*Vet. Form.* 12.) smeared on a piece of tow may be inserted into the bottom of the wound, which may be retained in its situation by splints of wood passed under the shoe; the dressings should be renewed daily, in some cases a run at grass will be found necessary.

CANKER.

The causes and symptoms of this affection are similar to those of the thrush; the disease involving the bars of the frog, the heel, and the sole of the foot. All the diseased parts must be removed by the knife, and the entire management entrusted to a skilful veterinarian.

ACCIDENTAL INJURIES OF THE FOOT.

(*Pricks or Punctures.*)

From the plan which is necessarily adopted of affixing the shoe to the foot by driving nails through a portion of the hoof, and from the small space which the structure of the hoof allows for the nails to pass through without injuring the quick, it must be expected that in some cases, by carelessness or an accidental eccentricity of direction in driving the nails some of them may enter into and wound the quick, which accident is denominated *pricking*. A simple puncture with a nail, if at first attended to, is a matter, comparatively speaking, of little consequence, but the effects which rapidly follow both this and many other at first trifling injuries, are frequently of the most serious consequences, inflammation is set up and matter is formed within the hoof, which, from whatever cause it proceed, whether from a wound inflicted by a nail in shoeing, shells, stones, or other bodies on rough roads, bruises, corns, sand cracks, treads, or over-reaching, must be allowed at once freely to escape, otherwise the suppurative inflammation will extend through the whole foot, producing complete destruction, permanent lameness, or a quittor. In every instance (except in unnerved horses) where suppuration takes place in the foot, great and

acute pain is soon evinced, and this continues until the matter escapes at the coronet, or the wound has been opened through the horn. But the difficulty in most cases consists in discovering the seat and nature of the complaint. To those unacquainted with the examination of the foot, the lameness is too frequently referred to some obscure situation; such as the shoulder, the hip joint, or the back sinews, and these parts are incessantly besmeared with ointments, until the mistake is discovered by the appearance of a collection of matter between the hair and hoof. So much danger arises from overlooking the diseases of the foot, that it would be a wise precaution in every instance where lameness occurs, to have the feet immediately and carefully examined; the shoe must be removed, the hoof pared when it is of much strength, and a degree of pressure firmly made by means of the pincers, pressing the foot from the one heel round by the toe to the other, making the sole of the hoof yield at every pressure that is given; and if in this way the foot is examined, the sore part can scarcely escape notice; the animal will draw away his foot from the pressure, the moment it is applied to the inflamed part. But lest in strong feet the hoof should withstand by its strength the pressure of the pincers, the hoof must then be further pared, and the examination repeated; or it may be gently tapped round the crust with a hammer, while the horse is standing carelessly at rest upon a flat surface, and in this case he will give way when the hammer has tapped upon the exterior of the sore part, if any such exist in the foot. Having thus ascertained the situation of the injury, a dependent opening must be made, by following the trace of the injury with a drawing knife until the matter is allowed to escape; the same treatment must be followed whatever may be the cause from which it has originated. It may truly be said in this case that a knowledge of the disease is half the cure, for having once discovered its seat in the early stage of the disease, the treatment is extremely simple; all that is generally required to be done, is merely to sooth the parts, and allay the irritation which has been produced by the removal of the detached horn, and the application of a few bran or porridge poultices, and the parts will soon reinstate themselves. It must, however, be remarked, that much depends upon the removal of every source of irritation in cases such as have been alluded to; for, unless the detached horn is carefully removed or well relieved from the diseased part, and also the sand or gravel which are commonly found in it, there is much danger of the disease extending, and sinuses or gutters forming, which prove in every instance of a troublesome nature. Having allayed the inflammation consequent upon a wound from a nail or any other cause, by the application of poultices repeated every night and morning; a dressing of melted tar with tow is commonly applied, which rapidly encourages a secretion of horn, and a few such dressings will put all to rights,—(*Abridged from the Jour. of Agric.*)

DISEASES OF THE SKIN.

MANGE.

This is a well known disease, and highly contagious; it however as frequently arises from debility and bad feeding. The horse is constantly rubbing and biting himself, great patches of the coat are thus rubbed away, and ulceration frequently supplies the place. Scabs appear at the roots of the hair of the mane and tail, large portions whereof fall away, leaving bare patches. The cure is simple; the sulphur ointment (*Vet. Form.* 12) well rubbed in once a day, generally effects a cure in the course of a week. Besides the local application alteratives (*Vet. Form.* 2) should also be given.

SURFEIT.

When the coat of a horse stares, he is said to labour under a surfeit. The skin is covered with scurf and scabs; these return although rubbed off. Sometimes the surfeit appears on the skin in small lumps, like peas or beans; this is often occasioned by the horse drinking much cold water when he is unusually heated. This kind of surfeit will be cured effectually by a gentle purge and bleeding. In some cases the scabs appear covering the whole of the body and limbs; sometimes these are moist, at others dry. These tumours are attended with a pricking pain, the animal appearing restless, flinching from the touch, and looking round sharp at his legs and side, as if he were spurred trivially. Whenever he can bring the parts to bear against the stall or the wall, the animal rubs violently, until the hair comes off, and the skin is raw. This affection is chiefly induced by over-feeding, therefore purgatives, and in some cases blood-letting, are indicated. These, with bran mashes, sodden oats, and exercise, will generally effect a cure. Should a moisture exude from the skin, a lotion may be applied, (*Vet. Form.* 10), having previously washed the affected parts by means of soap and warm water, and afterwards rubbing them dry.

MALLENDERS AND SALLENDERS

are scurfy scabby eruptions, affecting the back of the knee, and the inside of the hock, or a little below it; in the former case it is called mallender, in the latter sallender: they seldom produce lameness, and may generally be removed by the application of the ointment (*Vet. Form.* 12,) or otherwise the weak mercurial ointment, may be employed. A diuretic ball may also be occasionally given.

WARTS

may be easily removed either by the application of a ligature or the knife.

SWELLED LEGS.

The fore legs are sometimes, but the hind legs most frequently subject to considerable enlargements. Sometimes from metastasis, and at other times, without any apparent cause the hind legs become suddenly swelled to an enormous degree, accompanied with tenderness and excessive lameness, the pulse becomes quick and hard, in fact there is considerable fever. Fomentations, moderate blood-letting, diuretics or purgatives, generally succeed in removing this affection, which is an acute inflammation of the cellular substance of the legs, and occurs principally in young horses, and in those which are over-fed, and have little exercise. Swelled legs are sometimes induced from bad living or starvation, and is the result of debility. Here mild tonics and diuretics will be useful. Horses in good health are frequently annoyed with swelled legs, in consequence of irregular exercise. This is best remedied by proper daily exercise, friction by hand rubbing, and flannel bandages well and equally applied to the legs. In cart horses, wet hay bands may be substituted for flannel rollers. Should these means fail to afford relief, and only then, diuretics may be cautiously administered.

GREASE.

Swelled legs, although distinct from *grease*, are apt to degenerate into it. The following remarks by Mr. Youatt, are so much to the purpose, and so important to the farmer, that we shall give them in his own words. "Grease is an inflammation of the skin of the heel, sometimes of the fore, but oftener of the hind feet. It is not a contagious disease, although when it once appears in a stable, it frequently goes through it, for it is usually to be traced to bad stable management. The skin of the heel of the horse somewhat differs from that of any other part. There is a great deal of motion in the fetlock, and to prevent the skin from excoriating or chapping, it is necessary that it should be kept soft and pliable; therefore in the healthy state of the part, the skin of the heel has a peculiar greasy feel. Under inflammation, the secretion of this greasy matter is stopped, the heels become red, dry, and scurfy; and being almost constantly in motion, cracks soon succeed. These sometimes extend, and the whole surface of the heel becomes a mass of ulceration and soreness.

"The heel is subject to this virulent inflammation on account of its situation, far removed from the centre of the circulation. It is likewise exposed to more variations of temperature than any other part of the frame. As the horse stands in the closed stable, the heat of the part is increased by being deeply imbedded in straw. When the stable door is open, the heels are nearest to the door, and most powerfully receive the current of cold air; and when the horse is taken from the stable to his work, the heels are covered with mire and wet, and chilled by the slow and long process of evaporation, which is taking place from them. We cannot wonder then at the frequency with which the heels are attacked with inflammation, nor the difficulty there is in subduing that inflammation. In the winter season chaps and cracks will occasionally appear in the best conducted stables; but where the comfort of the animal is neglected, and every kind of filth is suffered to accumulate, the disease will be more frequent and more virulent.

The farmer's horse is not so subject to grease as many others, because he is not usually exposed so much to sudden and extreme changes of temperature, and the heels particularly are not thus exposed. In many instances he lives almost entirely out of doors, or, if he is stabled, the stables of the little farmer are not always air-tight. The wind finds its way through many a cranny, instead of entering at the door alone, and blowing upon the heels.

A great deal of error has prevailed, and it has led to much bad practice, in connecting grease with the notion of humours flying about the horse, which must have vent somewhere, and which attack the heels as the weaker parts of the frame. Thence arise the physicking and the long course of diuretics, which *truly* weaken the animal, and often do irreparable mischief. Grease is a local complaint,—it is produced principally by causes which act locally; and it is most successfully treated by local applications. Physic and diuretics may be useful in abating inflammation; but the grand object is to abate the inflammatory action which exists in the skin of the heel, and to heal the wounds, and remedy the mischief which it has occasioned.

The first appearance of grease is usually a dry and scurfy state of the skin of the heel, with redness, heat, and itchiness. The heel should be well washed with soap and water; as much of the scurf should be detached as is easily removable, white ointment, composed of one drachm of sugar of lead, rubbed down with an ounce of lard, will usually supple and cool, and heal the part.

When cracks appear, the mode of treatment will depend on their extent and depth. If they are but slight, a lotion composed of a solution of two drachms of blue vitriol, or four of alum, in a pint of water, will often speedily dry them up and close them. But if the cracks are deep, with an ichorous discharge, and the lameness considerable, it will be necessary to poultice the heel. A poultice of linseed meal will be the most effectual, unless the discharge is thin and offensive, when an ounce of finely powdered charcoal should be mixed with the linseed meal, or a poultice may be made of carrots boiled soft, and mashed. The efficacy of a carrot poultice is seldom sufficiently appreciated in cases like these

When the inflammation and pain have evidently subsided, and the cracks discharge good matter, they may be dressed with an ointment composed of one part of resin, and three of lard, melted together, and one part of calamine powder added, when these begin to get cool. The healing will be quickened if the cracks are occasionally washed with either the vitriol or alum solution. A mild diuretic may here be given every third day, but a mild dose of physic will form the best medicine that can be administered.

After the chaps or cracks have healed, the legs will sometimes continue gorged and swelled. A flannel bandage evenly applied over the whole of the swelled part will be very serviceable; or should the season admit of it, a run at grass, particularly spring grass, should be allowed. A blister is inadmissible, from the danger of bringing back the inflammation of the skin, and discharge from it; but the actual cautery, taking especial care not to penetrate the skin, must occasionally be resorted to.

In some cases the cracks are not confined to the centre of the heels, but spread over them and extend on the fetlock, and even up the leg, while the legs are exceedingly swelled and there is a watery discharge from the cracks, and apparently oozing through the skin at other places. The parts are exceedingly tender, and sometimes hot, and there is an appearance which the farrier thinks very decisive as to the state of the disease, and which the better informed man should not overlook,—*the heels smoke*;—the skin is so hot that the watery fluid partly evaporates as it runs from the cracks, or oozes through the skin.

There will be great danger in suddenly stopping this discharge. Inflammation of a more important part has rapidly succeeded to the injudicious attempt. The local application should be directed to the abatement of the inflammation. The poultices just referred to should be diligently used night and day, and especially the carrot poultice; and, when the heat and tenderness, and stiffness of motion have diminished, astringent lotions may be applied; either the alum lotion, or a strong decoction of oak bark, changed, or used alternately, but not mixed. The cracks should likewise be dressed with the ointment above mentioned; and the moment the horse can bear it, a flannel bandage should be put on, reaching from the coronet to three or four inches above the swelling.

The medicine should be confined to mild diuretics, mixed with one third part of cordial mass, or if the horse be gross, and the inflammation run high, a dose of physic may be given. From the account we have given, it will easily be distinguished in what cases physic is indicated, and in what states of the constitution or disease we may be content with diuretics. If the horse be strong, and full of flesh and fat, physics should always precede and sometimes supersede the diuretics; in cases of much debility, diuretics, with aromatics or tonics will be preferable.

The feeding will likewise vary with the case, but with these rules, which admit of no exception, that green meat should be given, and more especially carrots, when they are not too expensive, and mashes, if the horse will eat them, and never the full allowance of corn.

Walking exercise should be resorted to as soon as the horse is able to bear it, and this, by degrees may be increased to a gentle trot.

From bad stable management at first, and neglect during the disease, a yet worse kind of grease is occasionally found. The ulceration extends over the skin of the heel and the fetlock, and a fungus springs from the surface of both, highly sensible, bleeding at the slightest touch, and interspersed with scabs. By degrees portions of the fungus begin to be covered with a horney substance, protruding in the form of knobs, and collected together in bunches. These are known by the name of *grapes*. A stinking and very peculiar discharge proceeds from nearly the whole of the unnatural substance. The horse evidently suffers much, and is gradually worn down by the disease. The assistance of a veterinary sugeon is here indispensable."

In the course of the foregoing remarks, we have frequently had occasion to allude to "Read's Patent Veterinary Syringe:" its great superiority over every other instrument of the kind, induces us to recommend it to the attention of those of our readers, who are engaged in the cure and the management of horses, as an apparatus that can be used with considerable advantage, and with the greatest facility. The annexed engraving exhibits the instrument, and its mode of application.

VETERINARY FORMULÆ.

1. *Purgatives.*

Barbadoes aloes, three or four drachms.
Hard soap, four drachms.
Emetic tartar, two drachms.
Very Mild.

Barbadoes aloes, six drachms.
Spirits of turpentine, one drachm.
Mild.

Barbadoes aloes, eight or nine drachms.
Hard soap, four drachms.
Ginger, one drachm.
Oil of Caraway, six drops.
Strong.

2. *Alteratives.*

Barbadoes aloes.
Hard soap, of each twelve drachms.
Emetic tartar, half a drachm.
Ginger, half an ounce.
Oil of caraway, one drachm.
Treacle sufficient to form six balls, one of which may be given every morning, until a loose stool is produced.

or

Calomel, one drachm and a half.
Barbadoes aloes, three drachms.
Hard soap, six drachms.
Oil of juniper, forty drops.
Make into three balls, and give one daily, for a week.

or

Levigated antimony, six drachms.
Flowers of sulphur, two ounces.
Cream of tartar, one ounce and a half.
Mix, and divide into three balls.

3. *Fever Medicines.*

Nitrate of potass, one ounce
Emetic tartar.
Camphor, of each two drachms
Treacle, sufficient to form a ball.
(*Pharm. Vet. College.*)

or

Nitrate of potass, six drachms.
Tartar emetic, one drachm.
Powdered foxglove, one drachm.
To form a powder.

4. *Antispasmodics.*

Oil of turpentine, three ounces.
Laudanum, one ounce.
Warm ale, one pint.
Given in spasmodic colic.

or

Opium, one drachm.
Castile soap, three drachms.
Powdered ginger, two drachms
Powdered aniseed, one ounce
Oil of caraway, half a drachm.
Treacle sufficient to form a ball.—For Colic or Gripes.

5. *Expectorants.*

Tartar emetic, half a drachm.
Powdered foxglove, half a drachm.
Nitrate of potass, two drachms.
Tar sufficient to form a ball, one to be given every night.—For Chronic Cough.

or

Tartar emetic, two drachms.
Powdered foxglove, half a drachm.
Powdered squill, half a drachm.
Calomel, one scruple.
Nitre, three drachms.
Given every night in a malt mash.

6. *Tonics.*

Powdered gentian.
————Chamomiles, of each two drachms.
————Ginger, one drachm.

or

Sulphate of iron one to four drachms.
Ginger, two drachms.
Treacle, sufficient to form a ball.
(*Pharm. Vet. College.*)

or

Sulphate of copper, one to four drachms.
Ginger, two drachms.
Treacle or linseed meal, to form a ball.
(*Pharm. Vet. College.*)

or

Gentian powdered, four ounces.
Ginger, two ounces.
Coriander seeds, four ounces.
Caraway seeds, four ounces.
Oil of aniseed, quarter of an ounce.
Make into a mass, with honey or treacle, and give one ounce and a half, for a dose.—Cordial ball.

7. *Astringents.*

Powdered chalk, eight drachms.
———— Catechu, two drachms.
Opium, two scruples.
Thin gruel, one pint.
For Diarrhœa, or looseness.

or

Powdered opium, one drachm
———— ginger, one drachm and a half.
Prepared chalk, three drachms.
Flour, two drachms.
With treacle enough to form a ball, for looseness.
(*Rennie's New Supplement to the Pharmacopœias*)

8. *Diuretics.*

Yellow resin, two ounces.
Turpentine, four ounces.

Soap, three ounces.
Olive oil, one ounce.
Oil of aniseed, half an ounce.
Powdered ginger, two ounces,

Rub the two last together in a mortar, with a little linseed powder. Melt the first three articles over a slow fire, and then mix in the powders. Divide the mass into eight balls, and give one a day until the patient's water is affected.

or,

Yellow resin, four drachms.
Linseed meal, two drachms.
Ginger half a drachm

Palm oil sufficient to form a ball.

9. *Enema* or *Clysters.*

Epsom salts, six or eight drachms.
Thin gruel, five quarts.

Laxative.

Thick gruel, three quarts.
Strong sound ale, one quart.

Nutritious.

10. *Lotions.*

Sulphate of copper, eight drachms.
Camphor, four drachms.
Spirits of wine, two ounces.

Mix in a quart bottle and fill it with water. —For surfeit.

Solution of sub-acetate of lead.
Rectified spirit, of each two drachms.
Water one pint. Mix. (If used for the eyes two pints of water.)

Sedative lotion.

(*Pharm. Vet. College.*)

Vinegar, one quart.
Spirits of wine, half a pint.

For sprains.

Spirits of wine, two ounces.
Soap, two ounces.
Camphor, one ounce.

For inflammation of the kidneys.

11. *Embrocations.*

Muriate of ammonia, two ounces.
Vinegar one quart: mix.

To be rubbed into the part affected twice daily.—For sprains.

Flour of mustard, four ounces.
Liquid ammonia, one ounce and a half.
Oil of turpentine, one ounce.

Water sufficient to bring it to the consistence of cream.—Mustard Embrocation.

12. *Ointments.*

Lard, four ounces.
Melt, and add one ounce each of
Oil of turpentine.
Powdered Spanish flies, and stir till cold.

Mild blistering ointment.

(*Pharm. Vet. College.*)

Turpentine ointment, two pounds.
Cantharides in powder, ten ounces.
Euphorbium in fine powder, two ounces.

Soften the turpentine ointment by heating it, then stir in the cantharides and the euphorbium.—*Strong* blistering ointment.

(*Pharm. Vet. College.*)

Acetate of lead, two ounces.
Tar, four ounces.
Lard, twelve ounces.

For mallenders and sallenders.

Prepared hog's lard, two pounds.
Sulphur vivum, one pound.
White hellebore in powder, six ounces.

Mix with oil of turpentine sufficient to make a soft ointment, to be well rubbed in every other day.—For the mange.

Prepared calamine.
Verdigris, of each, half an ounce.
Alum.
Sulphate of Zinc, of each half a drachm.
Tar, three ounces.

Mix.—For thrush.

Acetate of lead.
Sulphate of zinc.
Vinegar, of each two drachms, well rubbed together in a large mortar: then add
Melted hog's lard, four ounces, and continue stirring briskly until perfectly incorporated and nearly cold.—For cracks or ulcers in the heels of horses.

Hog's lard.
Strained turpentine, of each four ounces.
Verdigris, one ounce.

Mix.—Digestive ointment.

or,

Ointment of yellow resin, four ounces.
Nitric oxide of mercury finely powdered,
Turpentine, of each one ounce.

Mix.—To form an ointment to promote the suppuration of sores.—Digestive Ointment.

(*Rennie's New Supp. to the Pharm.*)

Oil of turpentine, four ounces.
Tar, four ounces.

This application renders the hoof both softer and tougher, if applied by means of a brush night and morning.—Hoof Liquid.

STABLE MANAGEMENT.

The most important circumstances to be attended to in the stable management are cleanliness and ventilation, a hot close stable being, above all things, particularly injurious to the constitution of the horse. To prevent the many evils resulting from confined stables, ventilators should be placed in the most convenient part of the building, or a tube or funnel passed perpendicularly through the ceiling. It is an opinion too commonly received, that horses cannot be kept too hot; but there is every reason to suppose that many of the

diseases of the horse are brought on from the over and unnatural heat of the stables, and from the same heated air being so frequently inspired and expired. The heat of stables, therefore, should always be regulated by a thermometer. The degree of heat necessary to be kept up, should never exceed in winter, 50 deg. of Fahrenheit, or from 60 to 65 deg. in summer. It is not only necessary that stables should be well ventilated, but that the windows should be so constructed as to admit of light and air, and so placed as to avoid a current of air coming direct upon the bodies of the horses. Darkened stables being very injurious to the eyes, the free admission of light is, therefore, an object of the first consideration. The ceiling should be close and well plastered, which not only prevents the dust from the loft falling and entering the horse's eyes, but likewise the many exhalations from ascending and mixing with the hay, which would otherwise render it very unwholesome. Indeed it is at all times the best practice, where space will allow, to remove the loft quite away from over the stable. The stalls should be wide, for by that means strains in the back, and oftentimes worse evils, are avoided. It is also necessary that the paving should have a slight acclivity: if too much raised, as is often the case in dealers' stables, it puts the back sinews on the stretch, and very much fatigues the animals; a very *slight* acclivity, therefore, should only be allowed, to carry off the urine. The best method, however, of doing this, is by means of a small grating to each stall, communicating with a cess-pool out of doors, which should be so closed in as not to admit of a current of air coming through the grating, such a contrivance preventing the surrounding air becoming impregnated with the volatile parts of the urine. For the same reason the dung should be removed as soon as possible, and no heaps whatever, be permitted to remain within the walls; for the exhalations from the dung are also ammoniacal, and consequently hurtful. The form of the rack and manger should be attended to: racks sloping, and extending the whole length of the stall, are particularly disadvantageous, as they encourage dust in the eyes; they should therefore be constructed upright, and in one corner of the stall, but by no means too high, as the head and neck of the horse are often, by such a practice, put injuriously upon the stretch. The manger should be wide at the bottom, and of a proper height, and above all things, great care should be taken, to avoid splinters in the wood. It is also advisable that the manger &c., should at least, once a week, be rendered sweet and wholesome by washing; and nothing contributes more to rid the building of disagreeable smells, than occasionally whitewashing the walls and other parts.

The litter of horses should be kept perfectly dry and sweet, and never suffered to remain long unchanged, as is sometimes the case for days, under the notion of its making better manure, for on the contrary, it undergoes decomposition much sooner when removed to the dung pit, than it otherwise would do in the open exposure of the stable, and will consequently possess better properties as a manure. Whether the litter should remain under the horse during the day, or removed entirely away, appears to be a matter of variance, some maintain that the litter preserves the shoes and feet, by preventing the uneven surface of the stable from hurting them, while others say that it does them a positive injury, by not only rendering them tender and hot, but is very apt to cause swelling at the heels. We must confess we are disposed to adhere to the latter opinion, for two reasons, 1st. That the litter becoming necessarily saturated with urine, it cannot possibly be beneficial to the feet. 2nd. That swellings at the heel have been known immediately to decrease on the removal of the litter. A little, however should be strewed behind, as it not only obviates the effects of kicking, but prevents the splashing of urine in mares. Horses however that have been worked hard, and have been a long journey, require to lie down during the day, in such cases the litter should be suffered to remain, but, notwithstanding, cleanliness must be observed in clearing away the dung.

Grooming—This duty is too well known to need description; the operations of dressing, rubbing down, the application of the brush, and the curry-comb being indispensably necessary, not only for the cleanliness, comfort, and appearance of the animal, but for the preservation of health, and the prevention of disease.

Clothing.—This is unnecessary during the summer, to all descriptions excepting the race horse; it is, however, necessary in cold or chilly weather with such horses as are expected to appear in good condition. The usual suit consists of a kersey-sheet and quarter-piece, and sometimes only with a sheet, girded with a broad roller. "This roller, (says Lawrence, jocosely,) our tea-kettle grooms in former days, were in the habit of girting so tight that the horse stood in constant pain, with the sage purpose, in their phrase, of "getting up his carcase," the evil of carrying such a one, granting it an evil, can only be safely remedied by dry meal and regular exercise. All coach and cart horses, whilst standing out during cold rains, fogs, or winds, should have a substantial dry sheet thrown over them, it may prevent a cold and running at the nose, caught in one minute, which may require one month to remove. The hood and breast plate are sometimes added to the above suit, but are seldom used except in case of sickness, or upon the race horse.

Food.—The general stable food for horses, consists of meadow hay, oats, white or black, small, or horse beans, and white peas. Grain and pulse are commonly used as articles of food in addition to the hay, which, of itself, is not considered sufficiently nutritive and substantial to support the animal under his most laborious and trying duties. Oats is the

grain generally chosen, from its being the most nutritious of any corn, and agreeing best with horses. To be of the best quality, they should prove sweet, heavy and thin in the skin, and so thoroughly winnowed, as to do away with all the light grain and tailings. The quantity of food necessary for a horse, must of course be regulated according to the nature of the animal, and the work required of him. A horse of ordinary work, it is generally allowed, will require a peck of sound and good oats in twenty-four hours, though when the work is laborious and unremitting, they require more to keep them in condition. The pulse, used as food, are peas and beans: beans should not be given too liberally, as they produce thirst, and make horses costive; they should always be split prior to being given, and in that state are useful to horses that are in the habit of "throwing off their meat." White peas are sometimes mixed with oats by way of change, but beans are preferable. Chaff is sometimes given to horses, mixed with their corn, to make them grind the grain. Too great a quantity of food, however must be guarded against, as the stomach, in that case, becomes distended, and is thereby rendered incapable of healthy digestion; crib-biting, hind-bound, &c. are the necessary consequences. Hay should not be given in too large quantities; from seven to ten pounds in twenty-four hours, upon an average, will be sufficient for most horses. When it can be conveniently done, the quantity of both hay and corn, should be divided into four meals, the largest portion being given at night, the next in quantity in the morning, and the other two smaller portions about noon, and at four in the afternoon. This, however, must depend upon the work, and other circumstances. When a low diet is required, bran is sometimes given in the form of a mash, the proper mode of making which is to pour a sufficient quantity of *boiling* water upon the bran, and afterwards to cover the vessel up closely until the mixture has acquired the temperature at which we wish to give it to the animal. Bran mashes are used in preparing horses for physic, and likewise for such horses as are apt to be costive. A mash of equal parts of bran and corn, is very efficacious in keeping the body open, the oats being scalded with the bran, otherwise they are apt to pass through the body unmasticated, and consequently of little or no benefit to the animal.

Green Food.—Where the opportunity of turning out to grass does not occur, green food such as clover, tares, vetches, lucern, &c. should be given occasionally in the stable. Corn may, or may not be given at the time, according as a purgative effect is, or is not required to be produced by the green food. Nothing, however, is of greater advantage to a horse, and that renovates the constitution and legs so much after hard working or riding, as pure air, green food, and exercise, *ad libitum*, by being turned out for a few weeks.

Water.—The watering of horses is a very important feature in their management. The quantity must be regulated according to circumstances, as the weather, the work, &c. Half a stable pailful, twice in the day, with "a bumper at parting," *i.e.* at the final racking up, at night, is deemed sufficient for a horse of moderate work. It ought never to be given immediately before or after the food. Horses should never be galloped after drinking; it has been the death of thousands, occasioning inflammations, gripes, and broken wind. If a horse be suffered to drink at a river or pond, during its journey, it should never be allowed to take more than half its fill, and after walking him for about ten minutes, suffered to drink all that is required, and again walked for a short time. It may not be a fact generally known, that a horse suffered to drink at pleasure, will consume less water in the course of twenty-four hours, than he would have done if he had been watered in the usual way, and allowed to take his fill at each offering. It is, indeed, proved by experiment, that a horse will drink less in this way by a gallon a day upon an average. In order to take off the hardness, chill, or any other noxious properties from the water, it should be put into troughs in the yard, and exposed during the day to the full action of the sun and air.

RULES FOR ASCERTAINING THE AGE OF THE HORSE.

The names by which horses and mares are distinguished while young, are, if horses, *colt foals* during the first year, afterwards *yearling, two-year-old,* and *three-year-old colts,* until four years old, when if they have been castrated, they become *geldings,* and otherwise entire *horses or stallions.*

The mares are called *fillies* while sucking; then *yearling, two* and *three-year-old fillies,* until four, when they are called *mares.*

The *age* of a horse or mare is calculated from the first of May: thus,—previous to that month, they may be said to be *rising* four, five, or six years old; but when it is past, they are said to be four, five, or six years old, *off,* until after seven years, when they are termed *aged.*

The general appearance bespeaks the age of every animal, to those who have had much practice, but the most certain criterion is that derived from the teeth. The horse has forty teeth, viz. twelve front teeth—six below and six above, which are called incisors or nippers; twenty-four molares or grinders—six on each side, above and below; to which are to be added, four canine teeth or tushes—one above and one below, on each side, which are generally wanting in the mare.

From two years and a half old to three, a horse sheds the two middle teeth of the lower jaw, and the corresponding teeth of the upper.

From three years and a half old to four, he sheds the two next in both jaws.

From four years and a half old to five, he sheds the two outermost teeth in each jaw; and at the same time the canine teeth or tushes make their appearance.

From five years old to seven, the age is judged of by the appearance of the cavity in the front teeth. The two middle lower teeth, which are lost first, are replaced by others, having a hollow mark in the middle.

When a horse is coming six years old, the cavities are almost worn down, and the black marks in them will have nearly disappeared, shewing only a black spot.

Between six and seven, the two middle teeth fill up in the same manner.

From seven to eight years old, the marks in the two corner teeth are worn down, so that all power of discriminating the age of a horse, as far as the lower front teeth are concerned, is lost; at the same time the tushes alter their appearance, and become round or convex next to the tongue, instead of being concave.

After the age of eight, the upper teeth, and some other circumstances must be looked to; for the upper teeth are not worn down so soon as the lower.

At eight, the cavities of the two middle upper teeth disappear.

At ten, those of the two next.

And *at twelve*, those of the corner or outermost.

Aged horses lose the transverse ridges, which are so prominent at the roof of the mouth of the young, and which gradually become flatter and more level as they advance in life. The eye likewise becomes sunken, the eyelids lean and wrinkled, and the cavity above the eye more hollow. Grey hairs shoot up upon the forehead and lower parts of the mouth, the lips become lean and shrivelled; the lower lip hangs much below the upper, and the ears drop laterally. The annexed engravings represent the appearance of the teeth at the different ages.

Three Weeks Old.

Three Months Old.

Three Months to Three Years Old.

A The pincers | C The corners
B The separators | D The tushes

Five Years Old.

Six Years Old.

Eight Years Old.

It is not an unfrequent practice for jockeys and breeders, in order to make their colts seem five years old when they are but four, to draw the outer front or colt's teeth in each jaw, but if these teeth are gone and no tusks appear, the purchaser may be sure this trick has been played. Another artifice they use is, to beat the bars every day, with a wooden mallet, in the place where the tusks are to appear, in order to make them seem hard, as if the tusks were yet ready to cut. It is likewise a practice among horse dealers to perform the operation of bishoping, as it is called, to make aged horses pass for only six or seven. It consists in hollowing the middle teeth a little, and communicating a black colour by means of a hot wire, made in proportion to the hole; but notwithstanding this fraudulent attempt, it may be easily detected by a little observation, as the hot iron always leaves a yellowish mark round the holes, like that which would be produced upon ivory treated in the same way.

HORSE RADISH.

Horse Radish (*Cochleária armorácia*), Tetradynámia Siliculósa, Linn.: and Cruciferæ, Juss.

The horse radish is a hardy perennial plant, growing naturally in marshy places, and by the sides of ditches, in many parts of England.

Culture, &c.

SOIL.

A deep soft sandy loam, with an open situation, suits the horse radish best.

PROPAGATED.

1. *By cuttings of the root.*—No vegetable can be of more easy culture; but to obtain *fine large* and *unforked* roots, particular management is required.

2. *The season for planting* may be at any time from October to March. Judd, a successful cultivator, however, prefers planting from the middle of February to the middle of March; he describes his practice as follows:—

"After having fixed on a spot of the garden sufficient for the crop I intend to plant, it is trenched full two feet deep, either with or without manure, according to the state of the soil, which if in itself good, requires no enriching; but if it is poor, some good light manure ought to be added to it, and this must be *carefully laid into the bottom of each trench;* for, if not so done, the horse radish, which always puts out some side roots, would send out such large shoots from the main root in search of the dung contiguous to its sides, as to materially deteriorate the crop.

After the bed is thus prepared, plants are procured by taking about three inches in length of the top part of each stick, and then cutting clean off about a quarter of an inch of this piece under the crown, so as to leave no appearance of a green bud. Holes are then made, by means of a dibble, eighteen inches apart every way, and sixteen or eighteen inches deep; the root cuttings, prepared as directed, are let down to the bottom of the holes, which are afterwards filled up with fine sifted cinder-dust, and the surface of the bed is raked over as is usual with other crops. It will be sometime before the plants appear, and the operation of weeding must be done with the hand and not with the hoe, till the crop can be fairly seen; afterwards nothing more is requisite beyond the usual work of keeping clean, till the taking up of the crop; and this may be done at any time during the winter months."

Mr. Knight's mode of culture appears to comprise every requisite for the permanent production of the finest roots. It is thus described in the Gardener's Manual:—"Mr. Knight premises that the ground be previously trenched three feet deep, and that there be two or more beds side by side; each bed is to be four feet wide, with one foot alleys between the beds. Nine inches of soil is to be taken from the top of the first and laid on the surface of the next adjoining bed; then the first bed is to be trench digged, and planted with crowns only, the trenches to be fifteen inches deep, and the sets nine inches apart each way. The trenches are to be planted one after the other, but *the alternate beds only* will be cropped; thus, if there be four beds, the first and third will be planted, the second and fourth will be vacant; and, moreover, their surfaces will be higher by nine inches than the surfaces of the first and third. The plants must be kept free from weeds, and as soon as the leaves decay in autumn, let them be carefully raked off with a wooden-toothed rake. In the following February, *eighteen inches* of the earth of the unplanted beds must be laid as light and equally as possible over the beds that are planted; then trench and plant the vacant beds exactly in the same manner as before directed. The following autumn the first planted horse radish may be taken up, by opening a trench at the end of the bed to the bottom of the roots, so that the sticks or roots of horse radish may be taken up entire and sound, which for size and quality will be such as have not been generally seen. The following February the one-year old crop will require additional earth as before, (eighteen inches), which must of course be taken from those beds that are vacant, which, when done, if the ground appear poor or unlikely to produce another vigorous crop, they must have a coat of manure."

Preserving Horse Radish.

If dug up in autumn, it may be preserved through the winter in sheds or cellars, among sand or dry earth.

USE.

The root scraped into shreds is the well known accompaniment of "the roast beef of old England," and forms a grateful addition to winter salads and sauces.

HOT BEDS.

Hot Beds are very extensively employed in England and the northern parts of Europe, and but for their assistance we must necessarily be deprived of many of the luxuries of warmer climates that we now enjoy. The process of making a common hot bed may be considered by the professed Horticulturist as a work of supererogation; but it should be remembered that there are many persons, who, from local circumstances, cannot possibly participate in the luxuries of a garden, who nevertheless may derive both pleasure and amusement in the management of a hot bed and the raising of melons and early cucumbers, to such the following excellent instructions from the "English Gardener" may be useful:—

"Before we speak of the form and dimensions of a hot bed, it will be best, perhaps, to describe the frame which is to go upon it; because the reasons for the directions for the making of the bed will then the more manifestly appear. A *frame* consists of four pieces of wood, and, let us suppose it to be twelve feet long and four feet wide. Frames are sometimes of greater and sometimes of less dimensions; but, for the sake of illustration, let us take a frame of this size:—There must be one board, or two boards joined together, to make the back, twelve feet in length, and eighteen inches wide, one board, to make the front, twelve feet in length and nine inches wide. One board at each end to be joined on to the ends of the front and the back, eighteen inches at the back, and nine inches at the front. These boards being well dove-tailed together at the four corners, and being about two inches thick, form the frame. Upon this frame glazed sashes are put, which are called *lights*, and which rest upon the back and front, and ends of the frame, and also upon bars put across and fastened into the sides of the frame, in such a way as to form resting-places for the sides of the lights. This is quite enough of description; because the carpenters know how to make these things; and all that I have to do in this place is, so to designate them that the reader may know what I am talking about.

Having the intention to make a hot bed, you must first see that you have a sufficiency of materials. You take the stable dung, carry it into the hot-bed ground, and there put it into a conical heap. If you have not enough of dung from the stable door, some from cow stalls, sheep yards, and even long stuff from pig beds or pig styes, half-stained litter, or any thing of a grassey kind, and not entirely dry, will lend you assistance; but let it be understood, that the best of all possible materials for the making of hot beds, is dung from the stable of corn-fed horses; and the next best comes from a sheep yard, or from stalls where ewes and sucking lambs have been kept. Wheat straw is by far the best straw to have been used as litter, where the dung is wanted for hot beds. Bearing in mind that this is the best sort of materials, you must take what you have, and, if it be of an inferior quality, there must at any rate be a greater quantity of it. Having collected your materials together in the hot-bed ground, you next shake them up well together into a heap, in a flattish conical form. It is not sufficient merely to put the dung up together in this form; it must be shaken a prongful at a time, and shaken entirely straw from straw, and mixed, long with short, duly and truly through every part of the heap, from the bottom to the top. When thus shaken up, the short stuff on the ground where the dung was tossed down out of the wheelbarrow, ought to be shovelled up very clean, and flung over the heap. If the dung be good, you will see it begin to smoke the next day. It should be only two days and a half, or three days, before it be moved again. It should now be turned over very truly, well shaken in pieces again, and another conical heap formed of it, care being taken to put the outsides of the first heap towards the inside of the second heap. In two or three days more, it will have heated again sufficiently; and then it should be turned over once more, especially if there be a great proportion of long litter in it. If the dung be very dry, and the weather be dry also, and especially if it have a large proportion of long littery stuff in it, it should be watered with a watering pot, where it is mixed up, a watering being given all over the heap at every foot of height that the heap rises to. This is necessary to cause that fermentation without which there cannot be a hot bed; but, generally speaking, this is not necessary, for dung is seldom flung out with so large a portion of clean straw, as to prevent it from heating when thrown up in a heap.

It is as well to consider it to be a general rule scarcely ever to be parted from that the dung should ferment three several times during the space of nine days, before it be put into a hot bed. Unless this be the case, the heat of the bed (unless the dung be very short at the beginning) will not be lasting, and will never be regular; nor will the bed be solid and uniform. It will sink more in some places than in others, and will be hotter in some places than others; therefore it is useless to be impatient, since the thing cannot be done well without this previous preparation.

The dung being duly prepared, you make the bed in the following manner: having first made the ground on which it is to stand perfectly level. If the general surface of the

ground round about be on the slope, you must take care so to change the situation of that part of the ground on which the bed is to stand, as to make that part perfectly level. It is not sufficient that you have the top of the bed level, the bottom must be level also; or else the sinking on one side or at one end, will be greater than on the other side, or at the other end; the frame will stand unevenly, the slope of the lights will be too steep or not steep enough, the bed will sometimes crack, the water will run off and not sink into the earth, and, in short, without a perfect level whereon to place the bed, the inconveniences are endless.

Having got the level spot, you are to make a bed as nearly as possible of the dimensions of the frame: and the best possible way is to take the frame itself, put it upon the ground where you intend the bed shall stand, put up a straight piece of wood on the inside of each corner of the frame, while it is standing upon the ground, then take the frame away, then put a thin board edgeways upon the ground on the back and on the front, and at the two ends: which board ought to come on *the outsides* of the four stakes, and to be held up by four pegs You have then a true guide for making the bottom of the bed, and you begin by putting a little of the longest of the dung just at the bottom. Then you go on shaking the dung into this sort of box, dividing straw from straw, and mixing long and short duly together, in the same manner as was before directed in the case of the conical heaps, and taking care to keep beating the dung down with the prong in every part of the bed. When you have shaken in dung to the thickness of four or five inches, beat all over again, and so on at every four or five inches deep, until the work be finished. When you get to the top of the boards you will proceed very well without any, but you must be very careful to keep the outsides and ends perfectly upright; for this purpose, great care must be taken that the stakes at the four corners of the bed be placed perpendicularly. Strain the line now and then from stake to stake, and that will be your guide, Particular care must be taken to keep the *edges* of the bed well beaten as you proceed; for if you fail to do this, they will sink more than the middle will sink, and then there will be a crack in the earth in the middle of the bed. As you proceed, the perpendicular sides and ends ought to be well beaten also; and, when the work is finished, it ought to be a building as smooth and as upright as a wall, being perfectly level at the top, and, of course, of uniform height in all its parts.

When the bed is completed, put on the frame immediately. If the foregoing instructions have been observed, the bed will be about an inch longer and an inch wider than the frame. It should not be more on any account, especially if it be intended to receive those *linings* of which, in the cultivation of the melon and cucumber, it will be necessary to have recourse to. After putting on the frame put on the lights, and as you will not push the lights down in order to give air, you will find that the heat of the bed will begin to rise in the course of twelve hours or thereabouts. As soon as the heat begins to rise, there should be some air given to the bed, by pushing the lights, or some of them, down four or five inches from the back or drawing them up four or five inches from the front; for stench is not good, whether before or after plants be put into the bed. In about three days the bed will be in full heat. Some persons recommend to put a sharp pointed stick down a foot, or a foot and a half, into the bed, to ascertain the degree of the heat. Your finger is a great deal better than a stick: whatever heat there is must discover itself at the top of the bed, and there it is that your finger, well poked down into the centre of the bed, will enable you to judge of this matter a great deal better than any thing else. It is a very delicate matter: it is one of the things that demands the greatest possible attention; for, the heat of dung, though it will not probably come to a blaze, in any case, as a hay rick sometimes will, it will *burn* as completely as fire; and if the earth be put on too soon, it will burn the earth into a sort of cinder, in which nothing will ever grow until that earth has been for some time exposed to the atmosphere. You must, therefore, be very careful to ascertain that the burning powers of the bed are passed, before you put on the earth The rule for arriving at a certainty of this knowledge is this:—the next morning after you have made the bed, poke your fore finger well down into the centre of the top of it, and continue to do the same every morning and every evening, or more frequently. You will find the heat increase, till (if the bed be a strong one) the heat be too great for you to endure your finger in it for a moment. Soon after this, you will find the heat begin to decline; and as soon as you can bear your finger in it without any inconvenience, you may put on the earth all over the bed to about six inches depth, which earth ought not to be as dry as dust, but ought at the same time not to be wet These are the general instructions for the making of hot beds, which are to be of different heights, of different strength, and managed subsequently in a different manner, according to the nature of the different plants to be cultivated in them, and according to the season of the year when the sowing, planting, and cultivation is to take place"

HYSSOP.

Hyssop (*Hyssópus officinális*), Didynámia Gymnospérmia, Linn.; and Labiátæ, Juss.

The hyssop is a hardy evergreen aromatic shrub, rising from a foot and a half to two feet in height. There are three varieties of this plant, the white, the blue, and red-flowered, but the blue is the one most cultivated.

PROPAGATED.

By seed, slips, or cuttings; if *by seed* it may be sown in March or April, either broadcast or in drills eight inches apart. The plants will soon be up, and should be transplanted either into beds or as an edging a foot apart, they should be watered at the time of planting, and occasionally in dry weather until they are firmly established.

Cuttings from the stalks may be planted in April or May, in a sandy soil, where they will soon take root and grow freely. *Young slips* of the same year may be taken from the old stock in July, planted in a shady situation and occasionally watered, these will soon strike root and grow freely.

USE.

The leaves and young shoots are occasionally employed as a pot herb. Formerly it was in much repute for medicinal purposes, and even now, in the form of *tea*, is frequently employed by quacks and old women.

INDIAN CORN.

Indian Corn (*Zéa may's*), Monœ'cia Triándria, Linn.; and Gramíneæ, Juss.

The varieties of this plant are very numerous, some of these are natives of the warmest climates of America, and will not therefore ripen their seeds in this country, but a *dwarf variety* recently introduced by Mr. Cobbett, ripens its seed perfectly, even in the most unfavourable seasons.

From the high encomiums bestowed upon this plant by Mr. C. experiments were pretty extensively made in various parts of the kingdom during the summer of 1829, but from the little success that has hitherto attended its cultivation, it does not appear that the experiment has been repeated to any considerable extent during the present year; the fact is, Indian Corn can only be made to grow with any probability of success upon land of the *best quality* and in *favourable situations*; the preparation is expensive, and the plant in its early growth has to contend with so many enemies both in the field and in the air, that it must at all times be considered a very precarious crop, and the produce after all can scarcely be deemed more valuable than peas and beans, which may be cultivated at a much less risk and expense. If one half, however, of what Mr. C. has written about this plant were true, it would indeed prove a valuable acquisition to the British farmer; but if from the experience of the past we may calculate upon the future, then indeed no farmer ought to risk his capital upon the cultivation of Indian corn with the view of obtaining a remunerating crop. As a culinary vegetable or green food for cattle it may have higher pretensions, but upon this point experience is yet wanting to establish its superiority over other plants of acknowledged reputation.

Culture, &c.

SOIL.

This plant succeeds best in a rich light sandy loam, in an open situation exposed to the direct influence of the sun. In wet heavy tenacious soils and shady situations, however, it almost invariably fails.

PROPAGATED.

1. *By seeds*, which should be planted as early in the spring as the season will admit, from the 15th to the 20th of April may be considered the best period. For the sake of intercultivation the seed should always be planted in drills, and if for field culture they should be at least five feet apart; for garden culture three feet will be sufficient.

2. *Preparation of the soil.*—"Any land," says Mr. Cobbett, "without exception that will bear oats; not wheat or barley, but oats, or even buck wheat, may be made to bear a tolerable crop of Indian corn. One principal thing, is, in every case, to have the ground deeply ploughed late in winter, or in March, and ploughed again and well broken in April, and a little manure placed along the drills. The *best* preparation for corn, I should think to be the same as that for barley, the land prepared in precisely the same manner, and to be ready for planting in barley-sowing time. There is too, one very cogent reason for preferring this preparation, you are not exposed to the ravages of the black, or rather brown grub, or the wire worm, both of which are apt to be found in great abundance amongst the crops that succeed *leys*, on any ground that has long been unploughed. When wheat is sowed in this country upon a ley with a once ploughing, the plant is very frequently much injured by these mischievious things. The wire worm enters the spear, just above the seed, and eats out the heart. The brown grub keeps snugly just under the surface of the ground in the day time, comes out at night, bites off the plant nearly close to the ground, and re-enters its retreat. This danger must always exist if you plant upon a once ploughing in land matted with weeds or with grass; and, therefore, I recommend by all means, the avoiding of such tillage of the land for corn."

3. *The manner of planting* —"This," says Mr. C. "is a thing of the greatest importance; because, unless this be done properly, you have not the proper number of plants; the plants do not come up altogether as they ought to do; and, in short, according to the old saying, "the ship is lost for the want of a halfpenny-worth of tar." The greatest possible care must be taken not to have planters who talk, or, as they say in the country, whose heads are filled with proclamations. There must be the exact number of plants upon the acre; and these must be at their proper distances; for it is surprising how much may be lost by *gaps*." The surface of the field being finely broken by the harrow, and by the roller if necessary; the drawing of the drills is the next operation. Care must be taken that the drills be not *too deep*; and that there be no hole in them from the pulling up of clods; and that they be smooth or nearly so, at the bottom, so that the corn may be deposited at an equal depth all the way along the drill. It is like the planting of kidney beans, and as much care should be taken about it. The seeds are next to be carefully deposited six or eight inches apart in the row. where the wide intervals are adopted, but ten or twelve inches will not be too much where the intervals are only three feet asunder. After the planter comes a man with a little hoe to cover the seeds over with the earth; and this is a nice part of the business, especially if the ground be *cloddy*; for none but fine earth should lie directly upon the top of the seeds. The earth should not be more than an inch and a half deep upon the seeds; but it should be pressed a little upon the seeds, either with the hoe or with the foot. (In conseqence of the uncertainty of the crop it has been suggested to drop three or four seeds in spots about an inch asunder, seed from seed, the plants must be thinned during their subsequent growth the strongest only being allowed to remain, an additional expence is undoubtedly incurred by the extra quantity of seed required, but this will be compensated for by the greater certainty of obtaining a full crop; besides, as the plant bears transplanting remarkably well, new rows may be formed with the plants thus removed, and that too at a later season of the year. It is very difficult to get stiff land into *fine* tilth by the latter end of April, but this operation may be deferred where transplanting is adopted until the middle of May, or even the first week in June.) This work should be done in *dry* weather if possible, and should *follow closely upon the heels of the plough.*"

PLANT.

1. The plants from the time of their appearance until they are three inches high, require constant protection from the birds by day, and the slugs by night. The former can only be warded off by means of a gun, "but observe" says Mr. C. "the gun must be heard in the field, not only as soon as it is light, but a little before it is light, or the guardianship is totally useless, for birds go to bed before it is dark, and they move from their roost at the very first glimmering of light. This, however, is no very great thing to do, seeing that the danger only lasts for about a fortnight, for by that time the plants become no delicacy to the birds. Most farmers have a son who would rather be shooting a gun off all the day, then be at plough or harrow; and even if it be necessary to hire a man for the purpose, the cost is not very great. The only effectual remedy for slugs, is *hot lime*. The lime should be *very fine*. Put a gallon into a bag that will hold four gallons, and let the

bag be of the same stuff that common sacks are made of. Go round the field, and at a yard distance from where the grass of the hedge begins, and as you walk along, give at every third step, the bag a *shake* or two. You may keep walking on at a good pace. The ground will *all* receive some of the fine dust of the lime; of course the slugs will have their share, and the smallest touch of it will kill any slug. But if none should, he will lick some up at his next move, and that is equally destructive to him. But, observe, this must be done *after dark* and before *day-light*; or, just after *a rain*: for then the slugs will sally out in the day time. And, observe too, that this must be repeated several times; for slugs do not all come forth in the same night. Observe, further, that the lime loses its power, after it has had *rain fall upon it*, or after a *heavy dew*. So that you ought to count on its power for only once; and, therefore, it will be necessary to go round the outsides of the field, about ten nights running, just after the corn begins to appear above ground."

2. "As soon as the plants are three inches high, take a small hoe, with *sharp corners*, and hoe all the ground on both sides of the row of plant, to the distance of six or eight inches, and at a time when the ground is *not wet*. Take care to *move all the ground* between the plants, *and close up to their stems*."

3. "After hoeing, the plants will soon be from six to eight inches high; and the weeds, as if resolved to make up for their slaughtered brethren, will push on in crowds innumerable, over all the rest of the ground. Now, therefore, the *plough* must begin to move, not only for the destruction of the weeds, but for the furnishing of *fresh food for the plants*. The interval is five feet wide, the plough begins in the middle of it, and turns thee furrows on each side towards the middle of the interval, and going, when ploughing the two last furrows, within *two or three inches of the stem* of the plants, and going a *good depth* throughout the whole of the work; not, at any rate, less than six or seven inches. When you have ploughed one interval, go *not to the next*, but to the *next but one*; and thus go on over the field, leaving every second interval *unploughed*. All these ploughings of the intervals ought to be performed when the ground is *dry* on the top. At the end of four days plough these same intervals *back towards the plants*; and at the end of another four days, plough, *from the rows*, the intervals that were left unploughed before. The reason for this is, that in the ploughing, some of the roots of the plants will be, and *ought* to be, broken or cut off, and it is not right to do this on *both sides of the plant at the same time*. Thus ends the first ploughing, after which you will see the plants push away at a prodigious rate. If the ground be not very foul, one more ploughing is sufficient; that is to say, one more *double ploughing*, a ploughing from the plants, and another to turn the earth back. This second double ploughing must be regulated, in point of time, not so much by the time of the year as by the age, the height, and the state of the plants. About the middle of July, or earlier, the plants will be about a foot and a half, or from that to two feet high. The tassel, or blossom head will then begin to make its appearance; at the same time the ears begin to shew themselves forming in the socket of the blades on the sides of the stalk. When the tassel begins to rise above the sockets of the upper blades, it is a good time to plough again, for by this time rains have, perhaps, battered the ground, and given time for the weeds to make a fresh start. Now, therefore, the second ploughing is to be given precisely in the manner before described. Having gone as closely to the roots as possible, at the first ploughing, it will be advisable to keep at least six inches from them in the second ploughing; and this will be quite enough."

4. *Earthing up the plant* is the next operation, which is to be performed immediately after the second ploughing, the *suckers* being previously removed. "Each plant will send out from the bottom of the stalk, just where it meets the ground, one, two, three, four, or or more *suckers*. These must be taken off by pressing the bottom ends of them *downwards*, so as to leave each plant nothing but a single stalk. The suckers will amount to a very little in point of bulk; but, still, they will pay for the labour, for they are excellent food for hogs or cows. The suckering should be performed by a trusty person, who has strong fingers, and who is not too delicate to poke those fingers down into the dirt a little, for, unless you get the suckers completely out from the socket, they are sure to start again." All the suckers being removed, "the earthing up takes place; which is performed by a large hoe, drawing, from the middle of the interval earth sufficient to hill up the stalks of the plants to the height of six or seven inches above the level of the ground where they stand. The earthing up answers two purposes; first, it keeps the plant stiff and steady, in case of very rough winds. The other purpose is (and this is the great purpose), to give the plant a *fresh stock of roots*; for the corn plant, like the hop bine, sends out, when earthed up, new roots from the bottom of the plant thus covered with the earth."

5. *Topping the corn.*—"The season for topping is not to be fixed on by the months, or by the days of the month, any more than the time for cutting wheat, or for taking off the ears of corn, is to be fixed on by such rule. The time for topping is, when upon stripping the husks open a little at the tops of the ears the grains of the corn are hard, not hard enough to grind; nor dry; but hard enough to resist the strong pressure of the thumb-nail. A second criterion is, all the farina having completely quitted the *tassel*, and the tassel being completely dead and dry. A third is, the perfect deadness of the ends of the silk. At this time, the husk which covers the ear is still *green*; and, indeed the whole plant is still nearly *green*; except the tassel and the silk. This state of the plant

will take place, earlier or later in the year, according to the weather and according to the earliest or lateness of the planting, generally it will be about the *end of the first week in September*. The *act of topping* is not very difficult to describe, nor is it very difficult to perform. A man goes with a sharp knife, cuts off the top to within about half an inch of the first cob; this brings off a part of the blades also. He then snaps off the other blades, or strips them off as near to the stem as he can, not taking any very great pains about the matter; and thus he goes on from plant to plant He lays the produce down in the interval, in convenient little parcels, not so large as to prevent the tops and blades being well dried, if the weather be fine; when they are well dried, they ought to be tied into little bundles or sheaves, and one of the tops will serve as a *band* to each sheaf of tops and blades;" these are subsequently stacked, and are generally " given as food to horses, or to milch cows, towards and in the spring of the year, March, April, and the former part of May. There is so much of sweetness in every part of the plant, that all animals are fond of it."

6. *The harvesting of the ears,* or, rather, the gathering of them, is performed when you see the husk turned white on the outside, and indeed when you find that the corn has become *quite* hard. The operation is performed thus; you take a cart, go up the interval, have a couple of men, taking each of them one row of plants, stripping off the ears as they go, and tossing them into the cart. When you get to the end of the field, the cart if not full, comes along another interval, where you do the same; and at any rate, the cart ought not to turn in the middle of the field, because there is not room enough for it to turn in a breadth of five feet without crushing some of the plants. Therefore if your cart be full before you get to the end of the field, you ought to go out to the end, turn upon the headland and come down the next or some other interval. When you bring in the ears, tip them down in a shed or barn floor, as a convenient place for husking and as a protection against the wet. Then comes the *husking*; that is to say, stripping the husk from the ears. This work is done by children even; it is a considerable job if you have any quantity of corn, but all the children of the farmer's family, and all the children from the work-house, if necessary, may be employed at it. A child ten years of age will do the work pretty nearly as well as a man. The huskers are seated conveniently around or at the side of a large heap; they have baskets placed before them, they strip off the husks, twist them out by the tail, fling them behind them, and toss the ears into a basket. While this is going on, the farmer himself, or some particularly trusty man, takes away the baskets with the corn in them, and having sorted them puts the *head ears* into the *corn crib,* which is in fact a little granary standing upon stones or upon posts surrounded with tin as a protection against rats and mice. The ends and the sides are not to be boarded but lathed with interstices too narrow to let out a full ear of corn. Here it is that the corn is kept; because, though in the hottest countries, there remains so much of moisture in the cobb, which feeds the grains and in which they are indeed *planted* by nature, that if the ears were to be put together in great quanties, they would mould more or less, if shut up in any situation that would exclude them from the sun, the air, and the winds. Mould never comes in the open air, at least it never does to substances of this sort." Next comes the operation of taking the corn off the cobb, which is not called thrashing but *shelling,* and it is performed by farmers in general in the following manner. They take a piece of iron, that has a sharpish edge to it, and fix it across a pretty broad tub; they then take an ear in their two hands and scraping it longways across this piece of iron, the grains fall into the tub, and they throw the cobb aside. A stout man, a man with strong wrists will shell from twenty to thirty bushels a day in this manner; and the American farmers generally do it in cold weather in the winter, and most commonly choose the fire-side as the scene of operation.

Use.

" It is eaten as a garden vegetable at the time when the grains, after being fully formed, become replete with a farinaceous milky pulp; that is, as I have found, from the close of August to the second week of October, or even later. The ear or cobb is broken off, it is then divested of its husks and filaments, the small foot stalk is cut to about an inch in length, and the whole is boiled for half or three quarters of an hour in water with a little salt. The ears are eaten with butter, salt, and pepper, according to the taste of each individual. It should be observed, that although the tall varieties will seldom ripen their seeds, the ears will notwithstanding attain sufficient maturity to be very fit for table use; but there is this material distinction between the dwarf and tall varieties, that at the time the seeds of the former become mellow and full of milk, they are so firmly fixed in the receptacle, that they must be bitten off; whereas, the whole ear, cobb, and all of the taller kinds, boils tender, and may be cut up with as much ease as the stalk of a cabbage; and it is as pleasant, in point of flavour, as the seeds. Indian corn as a vegetable must be very much liked or wholly disrelished, its taste is too peculiar to admit of a medium, it resembles as far as we may determine for others, that of artichoke blended with a sweet wort of malt. As an article of diet it appears to be extremely salubrious, and nutritive in proportion as it approaches to maturity. When perfectly ripe and ground into flour, it is said to make bread of a quality very unacceptable to most, unless it be qualified with at

least two parts of wheat flour to one of the meal; in these proportions it may be made into good and palatable bread. In the opinion of most who know the grain, it is considered a capital article of supply for the poultry yard, and not for poultry only, but for pigs and even horses. "Upon this grain," says Mr. Cobbett, "without any grinding, horses are fed, oxen are fatted, hogs are fatted, and poultry made perfectly fat by eating the grain whole tossed down to them in the yard. The finest turkeys in the whole world are fattened in this way without the least possible trouble."—(*Domestic Gardener's Manual.*)

INSECTS.

INSECTS DESTRUCTIVE TO FIELDS, ORCHARDS, AND GARDENS:

By J. RENNIE, A.M. A.L.S.

Author of "Insect Architecture, and Insect Transformations, &c. in the Library of Entertaining Knowledge," "Conversations on Geology," &c. &c.

A very great proportion of useful practical knowledge is obtained by unlearning error, and by stripping facts of the fanciful additions which are made by writers who compile books in their closets, without a personal acquaintance with what they undertake to describe. Upon the subject of insects, errors and fancies have been more than usually multiplied, in consequence of the difficulty of observing the actual facts in creatures so minute, which has also prevented the detection of mistakes—many of them of great practical importance—though had these occurred with regard to the larger animals, they could not have obtained belief from the most credulous. Holding these views to be of the greatest consequence then, with regard particularly to destructive insects, I shall endeavour to expose some of the more prevalent mistakes which are frequently met with both in books and in conversation, and this will give me the best opportunity of stating the simple facts, as I have examined them in nature, and not in books.

It may not be out of place however to remark, that in order to perceive what I shall point out, it will often require the observer to divest himself, as much as possible of his previous notions and prejudices, for these always exert a powerful influence in making us appear to see what really is not to be seen—fancy acting like a magnifying, and sometimes like a multiplying glass, and producing in this way, the strangest deceptions. Old Gerard, the herbalist, in this way affirms that he *saw* young geese growing upon trees, which dropt into the sea and were afterwards fully developed: and the celebrated French naturalist, Reaumur, tells us, that the gardeners of France were persuaded that the buds and flowers were extensively destroyed by a small fly, which swarmed upon them. As this fly, (*Bibio Hortulanus*, Meigen.) is very common in England, and may be known by its small head, longish body, and being less than half the size of the house fly; our readers may be assured that it has not the means, though it should have the inclination, of injuring a single bud or flower, for it has no mouth-instruments for gnawing or boring; the only food it takes being a little honey, which it sucks in a similar way to the butterfly. But even butterflies, particularly the white ones, *Pontia Brassicæ*, *P. Napi, &c.*) which frequent cabbages, are often by the ignorant accused of being destructive, though the only evidence for this is nothing more than their great numbers, and the devastation of the crops where they are seen to swarm. But in all such cases of destruction by insects, I would particularly press it upon the attention of agriculturists and gardeners, never

to accuse an insect because it is found abundant among the crops destroyed, or because it is found sitting or crawling on the very leaf or bud that is eaten—*unless it be seen actually eating*; for a great proportion of insect depredations is committed at night, by insects which conceal themselves in the day. It would be no less unfair, therefore, to accuse the flies and butterflies, just mentioned, of eating flower-buds and cabbages, than to accuse a pack of hounds of eating the grass of meadow previously grubbed up by a flock of sheep—merely because the hounds were afterwards seen coursing through the meadow. The butterflies, however, stand in a different predicament from the flies; for the caterpillars from which they have been transformed, are exceedingly destructive to cabbages, while the grubs of the flies feed upon dung, and will rather starve than touch any other sort of food. I press this unquestionable fact the more upon the attention of agriculturists that the most erroneous notions have been published on the subject, such as might lead to great vexation, and the useless waste of time and money. In a "Treatise on Agriculture," by W. Greaves, of Sheffield, which though it is little more than a shilling pamphlet, is sold at 12s. and the author moreover requests "that no purchaser will lend his book, or inform any other person, except his own family, of the contents," I find the following most absurd account of the *turnip fly*:—

"I have heard various accounts of the progress of this depredator: some say the attack is made in the smooth leaf, others say it commences in the rough leaf; some affirm that it is a slug, others are equally positive that it is a fly—some there are who are candid enough to acknowledge that they know not what it is, only they know it cannot fly, but can jump. In these circumstances I flatter myself will be found the cause of the disease here mentioned. The manure which is taken from the farm yard, and spread upon the soil already cleared for turnips, is afterwards turned in with the plough: the seed is then put in, and nature does the rest till it is time for hoeing. Now it must be obvious, that manure put into the ground at this season of the year (June) must be full of the eggs of flies which are seen to swarm upon manure heaps in the autumnal season, and there deposit their eggs for future generations in the succeeding years. These eggs are hatched by the heat of the sun, when the manure is laid upon the ground, or by the warmth of the earth when it is ploughed in, and make their first appearance in the shape of a caterpillar, which may be observed jumping and crawling in the land. The leaves of vegetables are their choicest food, and in turnip land, though they find nothing else, they find plenty of leaf, and on this they feed, to the absolute ruin of the root. This, I am persuaded, will be found the true cause of this alarming complaint; and the difference of the seasons in warmth and dryness, will account sufficiently for the different time of their appearance, sometimes in the rough, and at others in the smooth leaf."

As this contains almost as many mistakes as words, it will be unnecessary to follow Mr. Greaves farther in his mode of remedying the evil. The undoubted facts are, that none of the grubs which live among dung, ever touch a green leaf, so that the farmer need be under no apprehension of infecting his crops through the medium of manure; that no caterpillars nor grubs, except the maggot of the small cheese-fly, (*Piophila Casei*, FALLEN), can jump; that the supposed difference of time in appearance, arises from difference of species in the insects, and not from the same insect being retarded by cold, or forwarded by warm weather.

The insect which attacks the turnip crop in the seed-leaf, as soon as it appears is sometimes called the black jack, and sometimes the fly, but is a small leaping beetle,(*Haltica nemorum*, ILLIGER), with an oblong body,and the wing cases full of small dots. As the future prosperity of the plant depends on the nourishment of the succulent seed-leaves, when these are destroyed by this Haltica,the plant perishes,and so extensive are the ravages thus committed, that whole seeds have often to be resown. Arthur Young calculates the loss in Devonshire from this cause alone, in 1786, at £100,000. This same jumping beetle often also attacks seedling clover. The seed-leaf of the turnip is likewise often injured by a small weevil, (*Nedyus contractus*, STEPHENS) which, in the grub-state, mines into the roots of charlock, (*Sinapis arvensis)*, and probably is the same, or nearly allied to the one whose grubs cause the knobs on the roots of cabbage, cauliflower, and turnips themselves. This little weevil thrusts its beak (*rostrum*) into the seed-leaf of the turnip, and greatly injures the crop. Neither of these insects could ever be bred in dung. When the turnip is advanced to the rough-leaf, these insects either die, as most insects do, when they have laid their eggs, or betake themselves to some other plant, such as clover, suited to their taste. But the plants are by no means out of danger, even should they survive the first attack; for the *Halticæ* and *Nedyu* are succeeded by a no less voracious assailant, whose numbers are often prodigious. I refer to one of the saw-flies, (*Ténthredinidæ*), which is apparently of the genus *Athalia*, and appears in clouds. Marshall says it is commonly believed in Norfolk, that these insects come from over sea —a highly improbable, if not impossible circumstance; yet a farmer declared he saw them arrive in clouds so as to darken the air, while the fishermen say they have often seen flights of them pass over their heads, when they were a distance from land, and on the beach they were, in August, 1782, strewed so thick that they might be taken up in shovelfuls: about three miles inland again, they were as thick as swarming bees.

This history, however, is evidently reversed, as is very commonly done in accounts of insect depredations. Insects of this family indeed, seldom fly far, and could not, at all events, cross the sea, unless it might be a narrow bay or inlet, and if they had, we ought to have heard of their departure, as well as their arrival, since their extraordinary number could not fail to attract public notice. The nature of these insects is to lie in the pupa state during the winter, under ground, and then eating nothing and when at its appointed time the fly, which has four wings, comes forth, it only lives to lay its eggs on the leaves of such plants as it instinctively selects, and then flits about for a few days or weeks before it dies. It must have been, therefore, after the laying of the eggs on the turnips, and not before, that clouds of the flies were seen at sea and on the shore, though not arriving, but going away, impelled by that restless desire of change felt by all animals when death is approaching, and which, in the east, is yearly exemplified in the destruction of the terrible locusts whose numberless hosts always make for the sea, and perish there, as I have not a doubt was the case with the Norfolk saw-flies, as is proved by their lying on the beach in heaps, and, as I infer, dead or dying. But, though they were thus got rid of, they left a progeny behind them in the black grubs which were hatched from their eggs. In the following summer (1783) accordingly we are told, by the same author, that whole districts were so ravaged by these grubs, the descendants, in the second generation un-

questionably, of the saw-flies of the preceding August,) that many thousand acres sown with turnips had to be ploughed up.

An insect allied to the preceding is but too well known to those who cultivate goeseberries, being a four-winged fly, with a flat orange back, (*Nematus Ribesii*, STEPHENS) which appears early in spring, and lays its eggs about the under ribs of the gooseberry leaves. When these are hatched, a smooth green caterpillar appears, and numerous companies of them attack the bushes, and soon strip them of every thing but the leaf-stalks, which are too tough to be devoured. Like all other insects, these disappear suddenly, a circumstance always ascribed by the ignorant to the winds or the weather, whereas they all dig down for some inches into the ground, at the roots of the bushes, where they are changed into pupæ, and lie till the succeeding spring, when their equally sudden emergence all at once in the form of flies, is again ignorantly ascribed to blightening winds, or emigrations from over seas.

The latter opinion prevails so universally, even among the better informed classes in this country, that I think it will be important to mention several circumstances which prove its futility. There is not, indeed, a more indefinite and ill-understood word in our language, than *blight*, which is usually considered as some mysterious state of the air or winds, which not only may produce inflammation of the face or the eyes, but, wonderful to tell, has the power of generating myriads of insects, or at all events of wafting them along from—no one knows where. This blight has even been described by some, to wear the appearance of a haze, or blue mist, or a sultry, purplish, or orange tinge in the air, while others promulgate certain fancies about its containing honey-dew, or being produced by electricity. All these accounts, I am quite certain, are sheer nonsense, so far as insects are concerned, though there can be no doubt that cold bleak winds, easterly or northerly, will produce inflammation of the eyes, or shrivelling and browning of the leaves of trees and hedges, as sultry thundery weather, likewise, may sometimes effect; but honey-dew and insects can never be thus produced. This doctrine, however, having found its way from popular belief into respectable publications, it will require a little more attention, which I am the more induced to bestow, because it bears directly on the losses often sustained by hop-growers.

Dr. Good, in his Study of Medicine, persuaded himself that he had actually witnessed the progress of a blighting haze which spread the fly through a hop plantation; and a living writer, of note, (Mr. John Murray) in his recent work on "Atmospherical Electricity," tells us that the presence of the fly, (*Aphis humuli*), the barometer of the hop-grower's wealth, "will entirely depend, (else we are much deceived in our observations) on some morbid change in the plant itself, and these are linked together as cause and effect; now this morbid change will be connected with corresponding mutations in the atmosphere. Some blight, imported on the wings of the wind, by which the ambient air is parched, while a crippled and diseased vegetation transpires from its leafage the saccharine exudation called honey-dew;" and, as the eagles will collect where the carcase is, so aphides congregate where the leaves are imbued with this morbid nectar. It is true, various opinions have been entertained on this question, and not a few individuals maintain that this honey-dew is a secretion of the insect: if a distinct electric change had not been in these cases the often decided precursor of their presence, we might have closed with the opinion, but as the fact stands, we cannot give up convictions

founded on the repeated evidence of our senses. Last summer, in particular, we investigated the phenomenon with great care, the weather had been parched and sultry for some weeks previous, and the honey-dew prevailed to such an extent, that the leaves of the currant, raspberry, &c. in gardens, literally distilled from their lips, a clear limpid honey-dew, excreted from the plant, for the phenomenon was observable on those plants that were entirely free from aphides, and so copious was it where these insects were found, that had their numbers been centuple, they could not certainly have been the source of the supply. The question with me, however, was set at rest by applying a lens, having previously washed and dried the leaf by (*with*) a sponge, for in this case the immediately excreted globules became apparent."

This I doubt not will appear to those who are unacquainted with insects, not only a rational and plausible, but an unanswerable statement of facts. As he founds upon it, however, an expensive plan for preventing the ravages of the hop-fly, I thought it my duty to warn hop-planters from wasting their money on a visionary theory, by a letter in the *Times*, of March 4th, 1830, of which the following is a portion :—

"The fly neither does nor can feed on the honey-dew; and if it did, it would prove rather beneficial, than otherwise, by clearing it off from the leaves, whose respiratory functions it obstructs in the same way as treacle introduced into the lungs, will obstruct the breathing of animals. The unquestionable facts are, that the hop-fly, (*Aphis humuli*), so far from feeding on diseased plants, only selects the youngest and most healthy leaves and shoots, into the tender and most juicy parts of which it thrusts its beak, (*haustellum*), which is longer than its body, and no more fitted for lapping honey-dew, than the bill of Æsop's crane was for eating out of a shallow plate.

"The honey-dew itself, which Pliny hesitates whether to call the sweat of the heavens, the saliva of the stars, or a liquid produced by a purgation of the air, (*Hist. Natur.* xi. 12), is nothing more than the excrement of the hop-flies, as has been proved by the most distinguished naturalists, including Reaumur, Bonnet, De Geer, Sauvages, William Curtis, Kirby, &c. In opposition to these, Mr. Murray states that he found the honey-dew on "plants that were entirely free from aphides," and, "by applying a lens, having previously washed and dried the leaf by a sponge, the immediately excreted globules appeared." The latter phenomenon only proves, as it appears to me, that the leaf had been previously wounded, perhaps by the beak of some aphis, and thence there was exuded sap, not honey-dew; the former that the flies had abandoned, as they always do, the leaves covered by their excrements, unless these fell from flies on some overhanging branch. I have now in my study a plant of the chrysanthemum (*Anthemis Artemisiæ folia* WILLDENOW), the young shoots of which have swarmed with aphides all the winter, and the leaves below them are covered with honey-dew: so that a piece of writing paper laid under a branch, was in a few hours sprinkled all over with it. I tried the experiment of wiping it off from a leaf; but no more was formed when it was protected from the aphides above. I herewith enclose you some of the flies, the paper, and the leaves sprinkled with the honey-dew, which I have, by means of a lens, actually seen the flies eject, as any body may readily verify who will take the trouble."

[It] is no less absurd to talk of the aphides being wafted by the winds to [g]rounds and bean fields, for where, I may ask, can the winds pick them

up? Their eggs, again, supposed by some to float in the air, are both too heavy if they were set afloat, and the mothers glue them too firmly on the substances on which they are deposited, to admit of such an accident, not to mention their being always laid in autumn, while the flies never appear till the following spring, when instead of laying eggs, they bring forth their young alive, and in prodigious numbers. The cause of their sudden appearance in spring, is the hatching of the eggs laid the preceding autumn, as their sudden disappearance is occasioned by the death of the mothers, after having laid their eggs; and not at all in consequence of the state of the weather.

I shall give another illustration of this sudden appearance and disappearance of insects, in the instance of a very common moth in gardens, (*Lozotænia Ribeana*, Stephens), the caterpillar of which rolls the leaf of the currant, feeding upon it in concealment as its congener, the rose leaf roller, (*Lozotænia Rosana*, is the poetically celebrated "worm i' the bud." Indeed almost every tree and shrub has a peculiar species of this family to prey upon it, which not unfrequently strip every leaf from the branches. It is only when the leaves are beginning to expand in spring, that these caterpillars make their appearance, and in due course are transformed into small moths. These do not live above a week or two, but, before they die, they take care to deposit eggs, that are to be hatched the succeeding spring. They select, for this purpose, the lower branch of the bush, or tree, upon the smooth bark of which, or on some object adjacent, the mother deposits a patch of some forty or fifty eggs, carefully glued on with a tenacious cement. I found an extraordinary number of patches of these eggs on the currant and rose bushes, in my garden at Lee, in Kent, during the winter of 1829-30, and had them all pared off with a sharp knife: I put them all into a glass tumbler in my study, and early in March, the caterpillars made their appearance from the eggs in thousands, while the garden was quite free from them. Had they remained there, however, I have no doubt that my wise neighbours would have ascribed their appearance to easterly winds, blue mist, or blightening weather.

Could the eggs of insects always be thus found, we could make sure of preventing their ravages, but it requires no little skill in such matters to detect them, and, in most cases, they baffle our keenest researches. In other instances, we can easily destroy insects in their caterpillar-state, during winter; in the instance, for example, of a caterpillar sometimes very destructive to orchards, that of the brown tail moth, (*Porthesia auriflua*, Stephens). This caterpillar, during the summer of 1782, spread no little consternation over the country, its numbers being so prodigious, that Curtis informs us, in many of the parishes near London, subscriptions were opened, and the poor people employed to cut off the webs at one shilling per bushel; and, at first, about eighty bushels were collected in one day, and burnt under the inspection of the Churchwardens and overseers. "Almost every one," he continues, "ignorant of their history, was under the greatest apprehensions concerning them, so that even prayers were offered up in some churches, to deliver the country from the apprehended approaching calamity;" for it was supposed that they were the forerunners of pestilence or famine. Had any person acquainted with insects pointed out the winter nests of these caterpillars, which are very easily discovered upon trees, by those who know where to look for them,—the whole broods might have been extirpated in a few days, and at a trifling expence.

The ignorance which prevails on the subject of insects, and of which we have just given some striking examples, often leads to the accusation, not only of harmless, but even of useful beneficial insects. This is strikingly exemplified in the case of the wheat fly, (*Cecidomyia Tritici*) which often produces such extensive damage in the wheat crops, by laying its eggs in the opening ear, while the maggots hatched from them devour the embryo grain. The wheat fly itself, is very small, of an orange colour, with rounded wings, fringed with short hairs, and altogether it is not unlike a midge, (*Culicoides punctata*). But while this destructive fly frequently passes unobserved, the insects accused of the damage, are not only innocent of devouring the wheat, but they actually prey upon the destroyer; yet, from being found in the numbers upon the wheat at the same time with the real depredator, they get their full share of the blame. These are very easily distinguished, however, the real wheat-fly having only *two* wings, while those which destroy it have *four*.

In the same way it would appear that the grub of a beetle (*Zabrus gibbus*, STEPHENS), which has occurred in considerable numbers near Worthing, Brighton, Hastings, and also at Cambridge, has been improperly accused of destroying corn. "In the spring of 1813," say Kirby and Spence, "not less than twelve German hides, (equal to two hundred and thirty English acres, were destroyed by it in the canton of Seeburg, near Halle, in Germany; and Germar, (who with other members of the Society of Natural History at that place ascertained the fact,) suspects that it was the same insect described by Cooti, an Italian author, which caused great destruction in Upper Italy, in 1776. Not only is the larva (*grub*) which probably lives in that state three years, thus injurious; but, what one would not have expected, the perfect beetle itself attacks the grain when in the ear, clambering up the stems at night in vast numbers to get at it."

Now as all the family to which this beetle belongs are known to be carnivorous and not to live upon vegetable substances, it is highly improbable that they touched the wheat at all, but frequented it to prey upon the grubs of chaffers, &c. which there can be little question were the real cause of the mischief. Agriculturists and gardeners therefore should be careful before they set about destroying any prevalent insect, to ascertain that the one they attack is the real depredator, as it may as frequently happen to be one of those which feed upon the destroyers. The simple test is seeing an insect actually eat, and then there can be no doubt. It is only a few months ago, that we remarked in the Magazine of Natural History, an account by a correspondent of the ravages committed on beans, turnips, and hops, by the "shrimp" (grub) of the common lady bird (*Coccinella septem-punctata*), though these insects in both their active stages of life never touch vegetable substances,—feeding entirely on the green flies (*Aphides*) which are the cause of the destruction of which the lady-birds have been thus unjustly accused. This gentleman, however, seems to have thought himself entitled to charge the lady-birds merely because he saw them resting on (*not eating*) the turnips and hops: on the same sort of evidence as we might accuse him of eating grass like Nebuchadnezzar, if we found him in a meadow.

It may be some comfort to agriculturists to be assured that however numerous and destructive any species of insect may be one season, they very seldom continue to be so for two seasons successively. This fact, indeed, has been ascertained in so many instances, that it might be con-

sidered established beyond question. In the case above-mentioned of the brown tail moth (*Porchesia auriflua*), which produced so much alarm in 1782,—we might have supposed that from the number of eggs laid, the number would have been greater the succeeding year. On the contrary, it has not been abundant since that period. I saw a few nests of them in 1828, but during the winter of 1829-30, I have not been able to meet with one, though I made some search both in hedges and orchards. From the myriads of fertile eggs of the leaf-rollers (*Lozotæniæ*), which I collected the same winter in my garden at Lee, I have no doubt that I should have had my bushes literally stript of their leaves; but even had these eggs been allowed to remain till they hatched and the caterpillars run their usual course, it is almost certain that I should not have been troubled with them in the succeeding summer of 1831.

Some assign definite periods, such as three, seven, or ten years, for the increase of particular insects; and in the case of locusts and the hessian fly of America, we are told of their gradually increasing in numbers and spreading over a greater extent of country; but, supposing this to be an accurate statement, of which I have some doubts, it will not apply to our insect depredators in this country; for these rarely indeed do much damage for two successive seasons, and they do not seem to follow any certain laws—sometimes missing one and sometimes several years, and again appearing in alarming numbers, as if they had been slumbering to recruit their strength.

It is not easy to assign any plausible reason for these irregularities in the increase or diminution of particular insects in particular seasons,—except we revert to the principal cause of it being wisely ordained by Providence, that when they become too abundant, their enemies, or some means of keeping them within due bounds, should increase in a proportional manner. Carnivorous insects destroy a great number, as well as ichneumon flies and other parasite insects, and they are well known to form the principal food of birds even for those which do not naturally feed upon them as the best food for their young. Along with these causes of destruction which are always in operation, varieties in the weather, no doubt, operate to foster or destroy insects. We are, however, too much in the dark upon this subject to be able to describe the particular temperature or other circumstances of the weather, which are favourable or unfavourable to insects. Cold rains seem the most likely to destroy, while warmth with moderate moisture is probaby best adapted for causing insects to thrive. At all events, I am very sure that the east winds, or blue haze, accused of causing them under the name of *blight*, is altogether an unfounded vulgar error which cannot too soon be exploded; for the insects thus ignorantly alledged to be propagated are uniformly hatched from eggs, and east winds are more likely to retard than to hasten the hatching, though like vegetation this is generally so regular that in the same species it seldom varies more than a few days in a succession of years

It is another very erroneous popular notion, that severe frosts, such as that of 1829-30, are beneficial in the destruction of injurious insects; for it is conformable to experience, that insects generally abound more rather than less after severe winters, and I can answer for the one just mentioned having had no effect whatever on the eggs of several insects which I exposed to it on purpose, and which have since been duly hatched; while the most delicate and tender caterpillars and flies have outlived the

severity, and are to be found as lively as if no frost had happened. I may instance a delicate fly (*Aleyrodes Chelidonii*, LATR.) with snow-white wings, and so small that it would not cover the area of a pin's head, three of which I found sporting about in the beginning of March, 1830, in Shooter's Hill Wood, and the holly-hocks in my garden at Lee, (which from lying low on the bank of a brook is very cold) are swarming with the caterpillars of the garden tyger moth (*Arctia Caja*, STEPHENS.)

METHODS OF DESTROYING.

It must be obvious from the above details respecting the irregular appearance of insects, that it would require a large volume rather than a few pages to form a guide which could be depended upon by the agriculturist or gardener, in a practical point of view. I have therefore deemed it more useful to expose unfounded popular prejudices about *blight*, &c. by contrasting them with undoubted facts, and thus lead those who are interested in the matter, to investigate the history of whatever insect may prove annoying to their crops. It would be no less easy, though utterly useless, to muster up a long list of compositions for destroying this and the other insect. The proved success of these compositions and nostrums indeed is almost uniformly derived from a fallacy. An insect, for example, is very destructive this year, and the infallible composition is tried the next, and to the great joy of the farmer succeeds to a miracle,—that is, Providence has so ordered it that the insect is not plentiful, while the composition obtains all the credit and confidence. The event would have been the same had no means been used; yet it would not be easy to persuade the inventor, or his disciples, that the natural event was not wholly owing to their endeavours,—no more than it would be possible to persuade some medical men that their patients are often cured by nature rather than by the medicines administered.

Such being the difficulty of the circumstances respecting insects, I shall not abuse the confidence of those who may peruse this paper, by proposing useless and expensive methods of destroying insects. Every one of these creatures has a peculiar mode of living, and this must be studied minutely before it is possible to arrive at an effectual mode of destroying them. Those who will not take the trouble of these investigations, and would rather trust to nostrums, proposed at hap-hazard by persons who know nothing of the economy of the insect they propose to destroy—must abide the consequences—and be content to lose their time and money to no purpose. Those who will take pains to trace the habits of an insect, have some chance of falling upon effectual methods of lessening the evil.

As all insects are as certainly hatched from eggs as pigeons or turkeys, when these can be discovered, it is an easy matter to destroy them; but insect eggs are usually so small and so carefully concealed, that this can seldom be done. Washing trees with soap suds and a brush has been proposed, but I much question whether the glue that fixes the eggs would be thus dissolved, and even if it were, the eggs would only be washed down to the bottom of the trees, where they would be as readily hatched as if no trouble had been taken. By washing in this way besides the eggs will only be come upon by mere chance; whereas to prove effectual, they must actually be found, and either crushed or removed.

Since in the grub and caterpillar state, it is in general more easy to meet with insects in the eggs before hatching; yet the former when first hatched are always small, and seldom attract notice till they have done considerable damage. By far the most certain remedy in such cases is actual picking

by the hand, or in the case of trees, shaking them into a large sheet by beating the branches, when it can be done without at the same time destroying the fruit. Turnips and grain in such cases may be brushed with net fixed on one or two long handles. When the insects are collected, however, it will not, as is sometimes done, be of any use to bury them under ground: they ought either to be drowned, burned, or crushed. On a small scale, a decoction of tobacco, or of henbane, or any similar poison, squirted over the plants by means of a syringe or a forcing pump, or even by means of a common garden pot, will kill a great many. Scattering quicklime or salt is by no means so effectual, though it is one of the best means for destroying slugs and snails. The latter, as well as some sorts of caterpillars, may be collected in numbers by hanging bits of rag on the trees or bushes, or scattering leaves of cabbage, &c. about the ground, which ought to be looked over every morning and the vermin destroyed.

All caterpillars and grubs when full fed become inactive, eat no more, and change into what naturalists term the *pupa* state, and as they suddenly disappear at this period, the ignorant ascribe their removal as they do their arrival, to the winds or the weather. In this state many of them lie under ground at the roots of trees and grass during winter. In the case of the gooseberry caterpillar, and the American blight, as it is called, on apple trees, caused by *Aphis lanigera*, it would be a good plan to dig round the roots in winter, and pour on a quantity of stale stable urine, the ammonia in which is deleterious to insects, and the same might probably be useful in destroying the grubs of cockchafers and the maggots of crane flies (*Tipulidæ*), which often produce so much damage in pasture and arable land.

When the perfect insects are disclosed from the pupæ, they seldom do much damage, as few of them eat any thing, their only duty then being to deposit their eggs before they die. A prudent gardener or agriculturist, however, will then be on the alert, and set all his spare hands to work in destroying crane flies, cockchafers, &c. before they have laid their eggs. A day or two in a season thus employed would often save a great deal of future loss, for by killing one mother, the ravages of several hundred grubs or caterpillars is certainly prevented.

Lee, Kent, April 1st, 1830.

IRRIGATION.

The main object of Irrigation, in all the inter-tropical and warmer parts of the temperate zone, is to convey to the ground that quantity of water which is necessary for the growth and nourishment of the plants to be produced. Sometimes, as in the case of rice, the earth must be saturated for successive months, and in others merely watered at intervals, during the periods of the greatest evaporation. In all these cases the main purpose is the same, namely,—to supply the deficiency of water in the soil; and this creates a remarkable distinction between the species of irrigation which are called for by the wants of man over so great a part of the globe, and that to which we apply the term in England, with relation to our watered meadows.

In these latter, the main object is not to supply the deficiency of water in the soil, for the water is conveyed over the surface at those times, namely, the months of winter, when their is an excess, and not a deficiency of moisture, nay, it is held necessary, in every well formed watered meadow, to drain the ground very thoroughly of all subterraneous water. Nor is this the only distinction between the two kinds of irrigation in the one, the water is generally allowed to stagnate until it shall have saturated the soil, in the other it is never allowed to stagnate, but is maintained in a constant flow over the surface.

In one respect the two kinds of irrigation may serve a common purpose, that is, by the deposition of mud or other fertilizing matter upon the surface. The principal effect,

which the Nile produces in its periodical overflowings is, the supplying to the soil that moisture, without which an arid soil, in a country where rain is scarcely known, would hardly produce anything. But this effect is plainly very greatly increased by the large quantity of mud which the river deposits. In the case, too, of the watered meadow, the water may, in like manner, deposit a fertilizing sediment; but this, though it always adds greatly to the effect, is not essential to the producing of it, and waters, entirely free from all perceptible sediment, are yet successfully employed in the case of the watered meadow. The well-known operation of warping is entirely different in its object and uses. In the case of warping, the whole end to be regarded is the deposition of mud. The tide is admitted by sluices, and having deposited the matter which it holds, is allowed to escape. In this manner, by repeated depositions, a large quantity of earthy matter is left behind, and a new soil formed. On the great estuary of the Humber, where this remarkable operation is chiefly carried on, the water, rendered turbid by the meeting of the tides and the fresh water, is conducted for miles inland, and, in the course of a single season, about a foot of the richest is added to the former surface. No improvement can be more effectual than this, but it is of a different kind from that produced by the use of the artificial watered meadow.

In the case of the latter, a stream of water is to be conducted to the surface and caused to flow over it in a constant manner, the meadow to be watered for the most part lying upon the bank of the river from which the water is conveyed, and forming a flat surface or rather a gently inclined plane. In the highest part of this inclined surface, the water is conveyed in what is termed the main conductor, either by building a wear or dam across the river, where the water is to be taken off or by bringing it from a higher source. From the main conductor, and as nearly as possible at right angles to it, are taken off the various feeders. These consist of small trenches of a few inches in depth, made widest where they issue from the main conductor, and gradually lessening as they recede from it. They may be formed at the distance from each other of forty feet or less, being nearer where the soil is stiff and retentive, and further distant where it is loose and porous.

The water is thus conveyed to the surface of the meadow, but it is necessary it should maintain an equal flow over the ground, and so be carried off as quickly as it is admitted. This is done by means of the main drain formed at the lower part of the meadow, and the several smaller drains, &c. passing between the interval of the feeders. These small drains are of the same dimensions as the feeders, but are larger where they enter the main drain, and become gradually smaller as they recede from it. The main drain conveys the water back to the river from which it is taken; but often this drain becomes, in its turn, the main conductor to another meadow or a lower level. For the water which had floated the upper meadow being collected in this drain, is carried from it, by means of feeders, in the manner described, and again collected in a drain below; and in this manner various meadows are successfully floated by means of the same water. And even where the lower meadows are nearly on the same level as the higher, it is still expedient to resort to this repeated collection of the water in drains; for it is found in practice, difficult to preserve the equal flow of the fluid over a very large extent of ground.

In order to keep the water, as it descends through the feeders, at the necessary level, and to cause it to overflow the surface, it is interrupted in its course by what are termed stops placed in the feeders. These sometimes consist of small pieces of plank, each resting on two little stakes, but oftener they are merely sods placed in the feeders, and sometimes fixed down by wooden pins. It is the province of the person who superintends the meadows, when floated, to adjust these stops in such away as to maintain an equal current over the meadow. Further, in order to convey the water quickly from the feeders to the drains, the surface of the meadow is generally formed into low ridges, the feeders being on the top of the ridge and the drain in the hollow. Such is the most perfect form of the watered meadow. But when the inclination of the plane of the surface is considerable, a different principle must be adopted as regards the conveyance and distribution of the water. In this case the feeders are not varied longitudinally through the meadow, but across the line of the descent. Here the several feeders are filled as before from the main conductor, but having overflowed their banks do not discharge the water into the smaller drains, but into the next feeder lower down; and thus the water is conveyed, from feeder to feeder, over the entire space of the meadow. This species of irrigation is termed *catch-work,* and as it can be adopted where the surface is too much inclined to admit of the flat meadow, it is frequently practicable where the other is not, and is often combined with it in the same meadow, where there are swells or considerable irregularities.

The process of floating commences generally in the month of October, being as soon as possible after the aftermath has been consumed, or the second crop of hay removed. The water is kept upon the ground for a period of a fortnight or three weeks at a time; it is then let off, and the ground laid perfectly dry, for five or six days; and this process of alternate flooding and drying, is continued generally during the months of November, December, and January, care being also taken to let off the water when it begins to freeze. As the spring advances, and the grasses shoot forth, the periods of watering are shortened, so that the flooding shall not last above five or six days at a time. In the southern counties of England, the meadows are ready for the reception of stock of all kinds in the middle of

March, but farther to the north, where the grasses do not make such early progress, the flooding is generally continued during the whole of the month of May. After this it is discontinued for the season, and a crop of hay, and sometimes two, are produced. The flooding is rarely practised during the months of summer, though the admission of water during that time produces a rapid and rich vegetation. It is by summer flooding, where it is practised, that the fatal disease of rot is introduced, so that no sheep should ever touch the meadows which have been flooded during the summer months.

The theory of this curious process has not been satisfactorily explained. That the effect is not produced by the mere supply of deficient water appears not only from the period at which the water is admitted, and when in our climate the soil is always saturated with the fluid, but from this, that the effect anticipated is not produced when the water is allowed to stagnate and sink down in the soil, but when it is kept in a current over it. When the water is suffered to stagnate, the soil tends to produces carices, junci, and other plants of an aquatic nature; but when it is kept in motion, and drained off at intervals, the finest grasses peculiar to the soil and climate, are produced. Neither does the fact of the deposition of mud or other fertilizing sediment explain the phenomena; for, however such depositions may increase the effect, it is likewise found that water, without the least perceptible sediment, may be employed with effect. It has been supposed that the water acts beneficially by maintaining the soil at a higher temperature. Water at a temperature of 40 degrees is of a greater specific gravity than at a lower temperature, and hence, as the water tends to the freezing point, the warmer portion of it is next to the ground. Much, however, cannot be ascribed to this cause in a current so shallow and constant as that which passes over the water meadow; it is probable, therefore, that the main effect is produced by some mechanical or chemical action of the water, in a manner unknown to us, on the plants or the soil. All that the irrigator therefore can do, in his ignorance of the principle, is, to mark well the effects—to admit the water at the time and for the periods which experience points out as the best—to maintain it in a current and not in a stagnant state, and to attend to the other rules and precautions which practice shows to be necessary.

Its effect is speedily to eradicate heath, and other mosses or lichens which infest the surface, and repress the growth of the nutritive plants, and in all our mountainous districts there is abundance of flat, low land, barren, or productive only of the worst herbage, in its natural state, which admits of irrigation from the innumerable rivers and streams by which such districts are traversed.

Journal of Agriculture.

JUNIPER.

Juniper (*Juniperus Commúnis*), Diœ'cia Monadélphia, Linn.; and Coniferæ, Juss.

This is an evergreen shrub of easy culture.

Culture, &c.

SOIL.

Will grow in almost any soil or situation.

PROPAGATED.

1. By *seed* sown in March, which will come up in about two months.
2. By *cuttings* raised under a hand-glass.

TREE.

Bears transplanting remarkably well, the best time for which is the beginning of October.

USE.

1. *The berries*, medicinally, are both diuretic and cordial: upon distillation they yield an oil of a greenish colour. The flavour and diuretic property of hollands is derived from this oil, as is also supposed to be English gin; but turpentine is always employed for the latter purpose.

2. The wood is hard and durable, and is used for a variety of purposes. The bark may be made into ropes.

3. A gum oozes spontaneously from the trunks of old trees, called gum sandarac, which is employed for making varnishes, and in its pulverized state is used for pounce.

KIDNEY BEAN.—*See* BEAN.

LARCH.

Larch (*Larix Communis*), Monœ'ecia Monadélphia, Linn.; and Coniferæ, Juss.

The Larch is a deciduous tree of great beauty, magnitude, and value; there are two or three species and varieties, which at present appear imperfectly ascertained; at Dunkeld and Athol there are a few large specimens of the Larix Pendula (Black Larch), and Larix Microcarpa (Red Larch). The red larch trees on the Athol estates do not contain one-third as many cubic feet of timber as the white larch of the same age, and the wood is so heavy that it will hardly float upon water.

Culture, &c.

SOIL.

The larch will succeed in almost any soil or situation excepting standing water. Rich soils, however, are generally unfit for the larch, but none are too poor for it; although it will grow for the first few years luxuriantly and even attain a large size in rich soils, nevertheless, in such it is apt to decay at the heart, and consequently be rendered useless in point of timber. It is not, therefore, the soils in which this tree appears to make the most rapid progress while young that are most congenial to it, but actually the reverse. To obtain it in perfection therefore, it would appear that a certain elevation of surface, coldness of climate, and inferiority of soil, are absolutely necessary. It is a curious and important fact that those soils in which the Scotch pine will not thrive are generally well adapted for the larch, on which account it has been recommended "where the planter finds his pines will not thrive (which he can so do by observing the turpentine exuding through the leaves and buds and covering them like hoar frost)," to root them up immediately and replace them with larches. In like manner, when the larch exhibits this appearance on the leaves, and especially on the branches, it will never come to maturity. Care must be taken not to mistake the *pollen* for this disease. The pollen appears only when the male flowers are in bloom, it has a tinge of yellow, and it seldom adheres to the leaves and never to the branches; whereas the turpentine is white and efflorescent, adheres to the twigs and leaves, and can not be shaken off without difficulty.

PROPAGATED.

By seed.—The cones may be collected in November or December, at which period the seeds generally ripen; as soon as they are gathered they should be dried, to prevent their getting mouldy, which occurrence would materially injure the seed. When sufficiently dry, they are to be laid up in a dry loft till April, the proper period for sowing. The seed are to be separated from the cones in the same manner as directed for the Scotch pine.

TREE.

1. As soon as the plants are fairly up they must be carefully weeded, at the end of the first year they may be transplanted into nursery lines of from twelve to fifteen inches apart, and from four to six inches asunder in the lines; but as it is often desirable to have a number of two year seedling plants, it appears desirable at the end of the first year to select the strongest plants only, which should be removed with care and transplanted immediately.

2. The proper time for planting out, will depend greatly on the intention of the cultivator, if a plantation of timber trees is required, then, the younger they are planted out, the more likely they are to succeed; but if for nursing up other trees, then a greater latitude may be allowed. Most of the deciduous coniferous trees are difficult to transplant when of a large size; whereas few trees succeed better when they are planted young, and of course of a diminutive size. Those, says M'Intosh, who have most successfully and extensively planted the larch, prefer trees not more than one year old as seedlings, and which have been one year nursed in good ground, and those will be by that time from about six to nine inches in height, and if the soil has been good, will have an abundance of fibres, a circumstance of far more importance to their future welfare, then if they were twice as large in branches. Indeed we would say that larches above eighteen inches in height, are much too large for planting, let the ground be ever so well prepared for them, and such as have pertinaciously persisted in planting them of a larger size, have been uniformly disappointed in the end.

3. The seed beds should be prepared after the manner of the Scotch pine, although Sang recommends as the best preparatory crop for seedling larches, that of two year seedling

Scotch pines, in default of which he prefers the employment of land, from which a crop of two year seedling larch has just been taken.

4. With respect to the pulverization of the soil, the manner of sowing the seed, and their distances apart, the same mode is to be adopted as recommended for the Scotch pine, the seeds being covered with mould to the depth of a quarter of an inch only.

USE.

1. The timber of the larch is possessed of extreme durability; hence it is extensively employed in ship building, house building, agricultural implements, bridges, lock and dock gates for canals and harbours, gates, palings, and posts of all kinds that are inserted either in the earth or water; indeed it is occasionally employed for all the purposes for which the best foreign deal is applied, and for many of those of the oak.

2. The chief objections to the timber of the larch are, its liability to warp and twist; but this may be effectually prevented by barking the trees in spring while growing, and not cutting them down till the following autumn, or even for a year afterwards. This is also said to prevent the timber from being attacked by the dry rot.

3. The bark, which is powerfully astringent, is very useful in tanning leather.

4. By incisions, this tree yields the purest Venice turpentine.

5. As a nurse, no tree, says Sang, is so essentially qualified as the larch. In most situations, even in very exposed places, and thin soils, it outgrows all other timber trees for the first ten or twenty years after planting: and if planted in sufficient numbers, in proportion to the principal trees to be nursed, it affords them good shelter, while by its towering, it tends to draw them up for timber. It will arrive at a timber size in almost any situation or soil, as already noticed, and of course it may with propriety be planted on the most broad and extended scale. Certainly had the vast forest tracts which have lately been planted with Scots firs in many parts of this country, been planted with larches, at least in those soils and situations adapted for them, the properties would have been greatly enhanced in value, the larch bearing the ascendency overs the Scots fir, in the following important circumstances —that it brings double the prices at least per measurable foot: that it will arrive at a useful timber size, in one half, or a third part of the time, in general, which the fir requires: and, above all, the timber of the larch, at thirty or forty years old, is in every respect superior in quality to that of the fir at a hundred years old. In short, it is probable that the larch will supersede the Scots fir, in most situations in this island, at no very distant period.

LAVENDER.

Lavender (*Lavándula Spica*), Didynámia Gymnospérmia, Linn.; and Labiátæ, Juss.

The lavender is a dwarf odoriferous shrub, a native of the south of Europe, and it appears to have been introduced into this country about the year 1658. There are two varieties:—

1. The Narrow-leaved.
2. The Broad-leaved.

Culture, &c.

SOIL.

A dry gravelly or stony soil produces the finest and best scented plants.

PROPAGATED.

By cuttings or slips, from six to seven inches in length, which should be planted in a shady situation in the month of March, watered occasionally, and shaded in hot weather till the germs have taken root. They may be finally planted out in the September or October following, either as distinct plants, from two to three feet asunder, or in continuous lines or hedge-rows. The fourth season they will yield a full crop, after which the plants will continue productive for three or four years.

USE.

1. The essential oil of lavender, sometimes called *oil of spike*, is a valuable stimulant.

2. The spirit of lavender enters into the composition of a compound tincture, which is grateful to the palate, and forms a useful cordial for the nervous of the fair sex.

3. Lavender water is a grateful perfume, and the dried spikes put into paper bags, are frequently placed by the country people among their clothes and linen to ward off moths, insects, &c.

LAYERING.

The operation of layering consists in selecting certain young branches of trees or shrubs, bending them down to the ground, and inserting them therein. When a branch is thus treated, the portion that is laid in the soil strikes root, and elevates a new stem from the original summit of the branch, which is now denominated a layer, and converted into a new individual, by detaching the branch from the original stem.

Seasons for Layering.

For trees and shrubs the proper season is that which precedes the ascent of the sap, that is during the months of February and March, or is deferred until late in June, or early in July, when the sap is fully risen. The latter period is generally preferred for layering the dianthus, or pink tribe

Operation of Layering.

Previous to fixing the branches into the earth, it is necessary that the ground should be dug for their reception. The shoot intended to become a new plant, is then *half* separated from the mother stem, a few inches distance from its extremity, by a clean incision, the parts uncut permitting the ascent of the sap during the season of rising, but the remaining half being divided, stops the progress of the descending sap, and thus interrupted in its course, exudes from the wound, forming a granulous protuberance, from which new roots will be thrown out In delicate plants, however, it is not sufficient that the cut merely be made, but it is necessary to slit up the notched side at least one inch, and separating it by a piece of twig; by which means the sap will be prevented from descending by the entire side of the shoot, or that which has not been cut, and thereby made to send out granulated matter, at the necessary place After the cut has been made, and the limb or branch properly adjusted, it must then be fastened down by means of a peg or hooked stick, so that its own force will not raise it up, at the same time taking care that the layer is fixed into the earth, from about three or four, to six inches deep. The mould is then thrown upon it, covering the limb all along from the point where it begins to touch, and raking it finely and equally, in every part, close about the layer. Pruning off all the small branches or shoots that stick upright, and allowing the tops of each layer to appear above ground, from two to six inches, according to their length, finishes the operation, and may be left in that state with the exception of keeping the ground clear from weeds, till the time of detaching the layers.

Separating the Layers.

Layers of most trees are fit to be detached from the parent stem at the expiration of a year. There are many sorts of American trees, however, that require two years to complete their roots, while most deciduous shrubs, layered about the middle of August, will be in a proper state for separation in the succeeding autumn.

LEEK.

Leek (*A'llium Pórrum*), Hexándria Monogy'nia Linn.; and Asphodéleæ, Juss.

The Leek is a hardy biennial, rising three feet in height, it flowers in May, the blossoms being of a purple colour; there are three varieties in cultivation:—

1. Flanders or Narrow-leaved Leek.
2. Scotch Flag or Musselburgh Leek.
3. London or Broad-leaved Leek.

The two last varieties are esteemed the best.

Culture, &c.

SOIL.

The soil should be light and rich with a dry subsoil, a rank soil being very unfavourable to the leek. When it is found necessary to manure ground for Leeks, it should be done a considerable time previous to sowing, and the ground dug several times over, in order to incorporate and pulverise the soil and manure, the manure being well rotted before hand

Propagated.

1. *By seed*, sown either in drills or broad-cast; if broad-cast, one ounce of seed will be sufficient for a bed four feet wide and eight in length.

2. The period for sowing is as early in the spring as the weather and the ground will permit; for an early crop a little seed may be sown towards the latter end of February, but as a general rule the main crops should never be sown until the latter end of March or the first week in April. A small successional crop for winter and spring use, if required, may be sown in the first week in May, and in every instance the seed must be carefully and evenly raked in.

3. The subsequent culture consists in weeding and thinning the plants when about three or four inches high, watering them frequently in dry weather, to forward them for transplanting from June till August, or when they are from six to ten inches high, for this purpose Abercrombie recommends thinning out a quantity regularly from the seed bed in showery weather, or after watering the ground; trimming the long weak tops of the leaves and the root fibres, and planting them by dibble in rows from nine to twelve inches asunder, by six or eight inches in the row, inserting them nearly down to the leaves, or with the neck part mostly into the ground to whiten it a proportionate length; giving them water if the weather be dry. Those remaining in the seed bed to be thinned to six or eight inches distant. In hoeing, the ground to be loosened about the plants to promote their free, vigorous growth. Topping the leaves once a month conduces to swell the stalk.

4. The main crops will attain a mature size in September, October, and November, and continue in perfection all winter and the following spring. When frost is expected a part may be taken up, and laid in sand. The late sown crop will continue till May without running to stalk.

5. *To save seed.*—Transplant some best full plants in February or the beginning of March, into a sunny situation, or in a row near a south fence. They will shoot in summer in single tall seed-stalks. They should be supported as necessary with stakes, and they will produce ripe seed in September. The ripe heads should be cut with part of the stalk to each; two or three of which are to be tied together and hung up under cover to dry and harden the seed thoroughly, when it may be rubbed out, cleaned, and put by for future service.

Use.

As a culinary herb, the whole plant being employed in stews, soups, &c. &c.

LETTUCE.

Lettuce (*Lactúca Sativa*), Syngenésia Polygámia, Æquális, Linn.; and Compositæ, Juss.

The lettuce is so well known as to render any description of it unnecessary. The following are considered the best varieties:—

Green Cos	Common White Cabbage
White Cos	Large White Ditto
Silver Cos	Brown Dutch Ditto
Spotted Cos	Imperial Cabbage
Egyptian Early Cos	Grand Admiral Ditto
Black-seeded Green Cos	Tennis-ball Ditto
White-seeded Green Cos	Hardy Green Cabbage or Capuchin
Bath or Brown Cos	Malta Cabbage
Red Cos	Large Roman
Florence Cos	Prussian
Paris Cos	Mogul
New Cape Cos	Hammersmith
Lap	Union Lettuce.—This is a newly introduced and an excellent sort, not being so liable to run to seed as the other varieties.
Brown Silesia	
White Ditto	
Green Ditto	

Of the above it may be admitted that the New Cape Cos is the best for general crops, as it grows very large and is tender and crisp, the Brown Dutch for being hardy; the Lap to be drawn out and used young in small salads, the Spotted Cos is curious. The Union Hardy Green, Tennis Ball, and Brown Dutch, are the most backward in starting to seed, therefore are highly useful for summer crops. To the Brown Dutch, as being so hardy

sort, we may add the Hardy Green, the Common White, and the Tennis Ball, any of which will stand the winter in ordinary cases.

Culture, &c.

SOIL.

All the varieties grow freely in any rich mellow soil where the subsoil is dry.

PROPAGATED.

1. *By seed*, sown broad-cast, moderately thin, and lightly and very evenly raked in, the ground being broken very fine at a previous digging. In dry weather it will be necessary to give a little water now and then, to keep the ground moist until the plants are fairly up.

2. *Time of sowing.*—In order to have a good summer and autumn crops of lettuces, they may be sowed once a month, from the beginning of February to July; and in August and September for late autumn, winter, and following spring crops. The autumn, winter, and spring crops, should be sown on a warm south border, well sheltered; but for a summer crop an open situation is more suitable.

3. *Subsequent culture.*—As soon as the plants in the seed bed have advanced two or three inches in height, they should be thinned out from a foot to fifteen inches asunder every way; and of those so thinned out, plant a quantity on good rich ground at the same distance, observing to take off a few of the lower leaves and the ends of the roots, planting them with a dibble and inserting them pretty well into the ground, and giving them a little water until they have taken fresh root. When they are about three parts grown, and the inner leaves begin to turn in or lap, they may be forwarded by tying the leaves moderately close together with pieces of bass, or they will lap without this assistance. Thus managed, the first crop will come in in the beginning of May, and will continue in succession until autumn.

4. In the month of October transplant a good quantity of the September sown plants out of the seed-bed, on a dry sheltered situation, three or four inches apart, to continue for winter and early spring use. At the same time transplant a quantity close together, into frames or hand-glasses, for protection in frosty and bad weather. Should there be a deficiency in frames, a quantity may be planted very thick, so as to be arched over and covered with mats from the rigorous weather.

5. Such plants as are planted for protection in winter, must have free air at all opportunities in fine weather, and in the middle of the day, when the sun is upon the plants, the glasses may be taken quite off, but must be put on again early in the evening, and kept close at nights and all bad weather. When all danger of frost is over, those crops which were planted thick in frames and borders and have survived the winter, should be thinned out to eight or ten inches apart, and the plants so taken out must be planted on another compartment at the same distance, and they will come to full stocky hearts in April and May, and thus the table will be supplied till the spring raised crop comes in.

6. *To save seed.*—If any of the winter stood plants, or any of the spring sown ones are left uncut, they will soon run up to seed, which will be ripe in the latter end of summer.

USE.

The lettuce is a much esteemed salad herb, and is also used in soups.

LIME TREE.

Lime Tree (*Tilia Rúbra*), Polyándria Monogy'nia, Linn.; and Tiliaceæ, Juss.

The lime tree is a tall handsome and hardy tree. In the time of Louis the XIV. it was much employed for ornamental purposes by the French as well as English gentry of that date. An ancient lime of great magnitude, which grew where the ancestors of Linnæus had long resided, is said to have given them their family name, *Linn*, being Swedish for a lime tree.

Culture, &c.

SOIL.

It thrives best in rich loam and in warm and rather moist situations, it will grow in almost any soil, but certainly is not calculated for exposed situations.

PROPAGATED.

1. *By seed.*—The seed ripen in October, and should be sown as soon as gathered, by which means they will vegetate the following spring, whereas if not sown till spring, they

would not vegetate till the following year, and conseqently one season would be entirely lost.

2. As soon as the plants are fairly up the seed-bed must be carefully weeded, and at the fall of the year removed into nursery beds, where they are to be managed in every respect as the ash.—(see *Ash.*)

3. *By Layers.*—Limes are generally increased by layers, but it is a mode that cannot be recommended, as it is an admitted fact, that trees originating from layers never make such fine trees as those raised from seed.

4. Limes propagated by layers may be operated upon in spring or in autumn, and at these seasons March and October may be considered the best. In laying limes the various processes of tonguing, slitting, ringing, &c. are dispensed with, as the plants are found to root so freely when laid in the more simple method of merely bending a part of the shoot, so that it may be buried about three inches under the surface, having the leading ends of the shoots shortened back to one eye, and that eye only a little above the surface of the ground; this bend is so performed that the bark is not even cracked in the process. Those shoots laid in spring will for the most part be fit to remove from the stool, and to be planted in nursery lines the spring following that in which they have been laid, and so in most cases will it be with those which are laid in autumn. When the young plants are removed from the stools or mother plant, they should be immediately planted out into nursery lines about two feet apart, and a foot or fifteen inches apart, plant from plant, in the lines. Here they may remain until they are finally planted out. The stools from which one crop of layers has been taken will continue, under good management, for a number of years to produce yearly crops of plants, and as these plants in favourable soils are of sufficient size for sale the year after being removed from the stocks, at least they will be larger than plants of five years growth originated from seeds. Nurserymen find a great saving in adopting this mode of propagation, but the consequence falls upon the planter, who is thus filling his ground with trees which will never be equal to those originated from seeds. The consequence is of far less importance if such trees be planted for coppice-wood, as when cut down to the root the future tree may under proper training be much altered for the better.

Use.

1. The wood which is delicately white and of a uniform colour, is extensively employed by carvers and gilders for most parts of their wooden ornaments; charcoal made of the wood of this tree is used in the making of gunpowder, and is also employed by artists.

2. The bark is an article of commerce. As the trunk of the tree is tall and free from knots, the bark may be stripped off in long pieces. These are macerated in water till the fibrous layers separate, and are then divided into narrow slips called bass, which in the northern parts of Europe are plaited into ropes and worked into mats. The mats in which flax and hemp are imported from the Baltic, and which in this country are in constant use by gardeners for covering plants from the weather and tying them up, are made of bass or the bark of the lime tree.

3. The flowers are fragrant and afford a great store of food for bees, and on this account the tree is often planted near those residences where apiaries are kept.

LIQUORICE.

Liquorice (*Liquorítia Officinális*), Diadélphia Decándria, Linn.; and Leguminósæ, Juss.

The liquorice is a hardy perennial plant cultivated for its roots, which contain a saccharine juice of a medicinal quality.

Culture, &c.

Soil.

A deep sandy loam, which should be well trenched to the depth of three feet, and manured if necessary.

Propagated.

1. By dividing the roots; the plants are obtained from old plantations, and consist of side-roots, which have eyes or buds. They may be taken off either in autumn, when a crop of liquorice is taken up for use, and laid in earth till spring; or taken from a growing plantation, as wanted for planting.

2. The planting season may be either October, February, or March; the latter month is generally preferred.

3. The plants should be dibbled in, in rows three feet apart, and from eighteen inches to two feet in the rows, according to the richness of the soil.

4. The after-culture consists in horse-hoeing and deep stirring, in weeding and in cutting over and carrying away the haulm, in autumn, after it is completely withered.

5. The plants must have three summers' growth, at the end of which time the roots may be taken up by trenching over the ground, and may then be preserved in sand till wanted for use.

6. During the first year, onions, beans, and carrots may be raised in the intervals.

USE.

A decoction of the root affords a saccharine juice, and is employed as a demulcent in catarrhal affections.

LOCUST TREE.

Locust Tree (*Robínia Pseudacácia*), Diadélphia Decándria, Linn.; and Leguminósæ, Juss.

This is a hardy fast growing thorny tree of middling stature, of no great beauty as a tree, but ornamental when young, and very well adapted for coppice-wood and rough timber. The leaves come out late in spring and fall off early in autumn, like those of the ash.

Culture, &c.

SOIL.

It will grow in almost any soil, but succeeds best in a deep rich loam and sheltered situations.

PROPAGATED.

1. *By seeds*, which may be sown in beds, towards the latter end of March or beginning of April. Mr. Cobbett, who is a successful cultivator of this tree, recommends soaking the seeds in hot-water, previous to sowing them. "Take" says he, "in the morning as much seed as you think you can conveniently sow before night; put it into a tub, or some vessel sufficient to hold the seed, with water five or six times as much in measure as the seed; then take water at full boil out of your copper or other boiling vessel, pour it upon the seed; give the seed a stir up amongst the water, cover over the top of the vessel close, and there let the seed remain for an hour or so. Then take off the cover of the vessel, and raise up some of the seed by a ladle or some such thing, and look at your seed, some of which you will find swelled to nearly double the former size, and some of them hardly augmented at all in size. Another hour, or perhaps less (and you ought to look frequently at them) will have made all the seeds swell, except a small part perhaps, and those will not grow at all. Then pour the seed, water and all into a fine sieve, which will let the water through and keep the seed back, have some dry sand ready, with a hole made in the middle of the heap to put your seeds into, and then mix up the whole heap of sand with the seeds, about three gallons of sand to one gallon of seed.

2. The seeds, with the sand, are then to be scattered evenly, but not too thickly on the seed-beds; if sown thinly, and the ground be good, the plants will attain the height of four feet by the month of October,

and may then be planted out into nursery lines, and after one or two years growth may be planted out where they are to remain.

3. This tree succeeds best when planted out young, for from the nature of its roots, which are long, and thinly furnished with fibres, it seldom succeeds well, if planted when of a large size.

USE.

1. In this country the locust tree is chiefly grown as an ornamental tree in the shrubbery.

2. In North America the timber of this tree is much valued on account of its durability, being much superior to oak for its strength and duration. Mr. Cobbett, who has written largely on the durability and uses of this tree says, "The *durability of this wood* is such that *no man in America will pretend to say that he ever saw a bit of it in a decayed state*. This seems hyperbolical; but every American of experience in country affairs will, if appealed to, confirm what I say. It is absolutely indestructible by the powers of earth, air, and water. The strength far surpasses that of the very best of our spine oak. It is to this timber that the American ships owe a great part of their superiority to ours. The stantions round the deck are made of locust; and while much smaller than the stantions of oak, will resist a sea three times as heavy as the oak will. The tiller of the ship is made of locust, because it demands great strength, and is required not to be bulky. For the same reason the martingales of ships are made of locust. The locust is rather a rare timber in America, but sometimes the futtocks or ribs of ships are made of locust, and if a ship had all its ribs, and beams and knees of locust, it would be worth two common ships.

"But important as these matters are, these are by no means to be compared to the various uses about buildings and fences. I have said that this wood is indestructible by the elements, except that of fire. How many thousands of houses are rendered useless in England, every year, by that thing which they call the dry rot, proceeding solely from those villainous soft woods which impatient people take such delight in planting, and which carpenters of delicate constitutions take such delight in sawing and planing. English spine oak is stronger than deal, and if you keep it dry it will not rot; but let it lie in the wet, or damp, and let the air get at it at the same time, and no villainous deal board will turn to earth more quickly. Window sills of the best oak will rot, if something be not done to keep away the wet from getting under them; and in this very way the dry rot has got into many a house. Oak door sills are rotten in a very short time. The ends of beams and of joists, if they rest upon brick or stone, where the moisture is constantly about them, rot in a few years. The points of rafters, and the pins which hold rafters together, are always rotting. If these things were made of locust, your house would be safe for ages. Everywhere when you want something to lie sopping in the wet, and at the same time to be exposed to the air, you should have locust. Endless are the uses to which it might be put. A bottle rack for instance, that you want to stand out of doors, and hidden in some corner; a grindstone stand, a horse block, but particularly a cart house, or anything that requires pillars, the bottoms of which are to go into the ground. Go into any farm yard in England, I do not care what farm yard it is, and you shall find in the cart house one of these things: first, the posts which support the building, rotting off very fast, just where they meet the ground; second, those posts rotted off and cut off, and some stones put under them, to the manifest risk of the cart-house; third, the cart-house actually tumbling down in consequence of the rotting off of the posts. This is notorious: every farmer, every landlord in the kingdom knows it. Now I will insert a note from my memorandum book, under date of October 16, 1819: 'At Judge Lawrence's, at Bagside, I saw a new cider-house, built against a hill, the upper story of it supported in front by some locust posts. These posts, the Judge told me, had stood for forty years, or rather better, as the posts of a cart shed.' They were as sound as they had been the first year they were cut down. In our stables, in England, you see stones put at the bottom of the stall post. What a plague it is! Little locust trees, only about seven years old would, for these purposes, make posts that would last for ever. Every one knows how the *sleeper* (as I think they call it) rots; that is to say the piece of wood that goes along at the bottom of each side of the stall. We know also how the manger posts rot off at the ground. Use locust timber, and it will wear out the stone walls of the building."

LUCERN.

Lucern (*Medicágo Satíva*), Diadélphia Decándria, Linn.; and Leguminósæ, Juss.

Lucern is a deep-rooting perennial plant, sending up numerous clover-like shoots, with blue or violet-coloured spikes of flowers.

Varieties.—There are no varieties worthy the attention of the cultivator. The yellow lucern (*Medicago falcata*), common in many parts of England, is a much hardier and coarser plant, but only cultivated in some poor soils in Switzerland.

Lucern was first introduced into this country from France, in 1657; it was much esteemed by the ancients, and has been long cultivated advantageously in France and Switzerland, but hitherto has not found that reception in this country, which, perhaps, it is entitled to. Columella estimated lucern as the choicest of all fodder, because it lasted many years, and bore being cut down four, five, or six times during a year. It enriches the ground, says he, on which it grows, fattens the cattle fed with it, and is often a remedy for sick cattle. About three quarters of an aere, he thinks, is abundantly sufficient for three horses during the whole year.

SOIL.

1. It requires a good land, as a deep, rich, dry loam: the subsoil also must be good and deep, or it will be useless to attempt to cultivate it.

2. The preparation of the soil consists in deep ploughing, and minute pulverization; undoubtedly the best way is to trench it over by the spade, to two or three feet in depth, burying a good coat of manure in the middle, or at least one foot from the surface. This, although an expensive process, is fully counterbalanced by the certainty of success, and early maturity of the plant.

SEED.

1. *Drilled* in rows, nine inches apart, between rows of barley equally distant. It is better to sow it with barley or oats thinly seeded, both on account of the profit of the crop, and as the grain furnishes some protection to the plant from the attacks of the fly, which does great injury to it when very young. It is oftentimes drilled at distances of eighteen inches or two feet, the intervals being well horse-hoed, but these wide intervals are much objected to by Mr. A. Young. If kept clean hoed, the lucern licks up so much dirt, being beaten to the earth by rain, &c. that it is unwholesome, and the plants spread so into these spaces, that it must be reaped with a hook, which is a great and useless expense. For these reasons, as well as for superiority of crop, he recommends drilling at nine inches, which, in point of produce, mowing, and freedom from dirt, is the same as broad-cast; and another advantage is, that it admits scarifying once a year, which is much more powerful and effective than any harrowing.

2. *Sown broadcast*, with a thin crop of barley or other spring corn for the first year; by far the greatest success has attended this mode of cultivation, which is nearly universal among the best lucern farmers, even among men who practice and admire the drill husbandry, in many other articles.

3. *The after-culture* consists in harrowing, rolling after the harrowing to smooth the soil for the scythe, and such occasional top-dressings of manure, as the state of the plants may seem to require. When drilled, horse-hoeing may be substituted for harrowing, which is the only advantage of that mode of sowing.

4. The quantity of seed per acre when *drilled*, is from 12 to 15 pounds; when *broadcast*, not less than 20 pounds will suffice. The seeds must be plump, and *perfectly new*: two-year-old seed does not come up freely. The same depth of covering as clover will answer. The seed should be sown as early in the spring as the season will permit; about the latter end of March or the beginning of April, will be the most proper period, for if sown late, there is more danger of the plants being destroyed by the fly.

PLANT.

1. Will last for nine or ten years, its ordinary duration in a productive state.

2. The produce cut three times in a season, averages from three to five, and even eight tons per acre. It frequently attains sufficient growth for the scythe towards the end of April or beginning of May, and will be in a state of readiness for a second cutting, in the course of a month or six weeks longer, being capable of undergoing the same operation at similar intervals of time, during the whole summer season.

3. In Spain they cut one day what will be wanted the next, and laying it in a heap, sprinkle it with salt water. This they think renders it more wholesome to cattle, which like it the better for being salted.

USE.

1. Lucern is much superior to clover for soiling milch cows, giving no taste to the milk or butter, and one acre is sufficient for three or four cows during the soiling season. It is equally advantageously given to horses and hogs; as a dry fodder, it is capable of affording much assistance, and as an early food for ewes and lambs, may be of great value in particular cases. Care must be taken that too much be not given in its green state, or, like clover, cattle may be hoven or blown with it.

MANGOLD WURZEL.*

Mangold Wurzel (*Betá*), Pentándria, Digy'nia, Linn ; and Chenopódeæ Juss.

The Mangold-wurzel is a kind of red-beet; according to Professor Thaer a *mongrel* between the red and white beet, it is chiefly cultivated for agricultural purposes, and is not liable to be injured by disease or insects.

Culture, &c.

Soil.

1. Mangold-wurzel will succeed on any land capable of producing good turnips, and frequently on such as is unkind for turnips.

2. *The Preparation of the Land.*—As the crop is taken on some part of the shift or course intended for turnips, the fallow or season is prepared in the same way, taking care to select a clean convenient part: it is necessary to have it clean, because the early sowing will prevent much being done to it, and it ought to be as near the farm-yard as possible, to save the carriage of the crop. If the land has been well ploughed before winter, and cross-ploughed early in the spring, another good earth will be necessary about three weeks or a month before sowing: this should be as deep as the soil will admit, and will give plenty of mould.

Propagated.

By Seed.

1. The seed may be either drilled or dibbled on the ridge, taking care to have it covered very fleet, not more than half an inch deep.

2. From three to five pound of good seed per acre will be found sufficient, and if a small quantity of Swedish turnip seed be mixed with it at the rate of half a pint to the acre, it may be the means of filling up vacancies in case the mangold-wurzel should fail, as it did last year, (1829), and there were many fine crops of swedes where so sown.

3. *The time of sowing* may vary from the middle of April to the end of May, generally speaking, the first week in May. The manner of sowing most approved is on the ridge; the land well manured, the same as for Swedish turnips, or more, according to fancy.

Plant.

1. *As soon as the plants can be seen on the ridges*, if the *weather be dry enough*, the ridges should be *horse-hoed*. The most useful implement for this purpose is the inverted hoe, invented by Mr. Blaikie. This work ought by no means to be delayed, and if it cannot be done in the dry, it must in the wet. There is a time in the growth of the weeds, which if once suffered to pass, no ordinary means will be sufficient to recover, and very many crops have in this County been lost by the neglect of it, and then the root condemned because of the difficulty of cleaning. After it has been horse-hoed once or twice, as the case may be, the plants may be set out by hand-hoeing to the distance of eighteen, twenty, or twenty-four inches;—the greater the distance, the larger will be the root, and most likely the crop heavier. After the two horse-hoeings, and the setting out of the plants, the land will be nearly level; the plants will require a second hand-hoeing when they have grown strong, and if the land should not be clean, it may be still horse-hoed as long as the plants will admit the implements between them. The ridges are supposed to be not less than twenty-seven inches apart.

2. *Taking up and securing the crop.*—As soon as the lower leaves begin to lose colour and drop, which if early sown, they will do in the last week in October, or beginning of November, the tops should be *twisted* off, and left on the land either to be ploughed in as manure, or fed by sheep; the former perhaps is preferable. The roots may then be pulled up by hand, or ploughed up by running a skeleton plough under the ridge, which will root them up: they should be taken to the most convenient spot for getting at in the winter, laid in ridges from six to nine feet wide at bottom, and five to seven high, covered with straw or litter, and about a *week or two afterwards*, well covered with earth thick enough to keep out frost. They will then keep as long as wanted. In taking up it is best not to pull up more than can be got away the same day, for if a slight frost should catch any laying out of the ground, it is sure to spoil them: whereas they will stand a pretty sharp one whilst in the ground and with the leaves on.

Use.

1. The principal use of the root is for winter or spring feeding, for fattening beast, stores, cows, horses, or sheep; but it *may* be used at any time fresh from the ground, provided

* Communicated by H. E. Blyth, Esq. Deepdale, Norfolk.

it is given in very small quantities at first, and taking at least a fortnight to increase to the full portion, when fatting beasts will be found to thrive well on it, giving hay at the same time.

2. Both the leaves and roots are extensively employed for feeding *milch cows*, especially in the neighbourhoods of large towns and populous districts,—as London, Brighton, &c.; and it is stated that the milk is not only increased in quantity, but improved in flavour also. The latter assertion, however, is very questionable, for when given in large quantities the milk is certainly altered in its texture, and becomes of a ropy consistence, which renders it very disagreeable. Sixteen or twenty perches of land cultivated with this plant, will, on the authority of Mr Doyle, support a cow, allowing her sixty pounds weight per day, for the five winter months.

3. As to its value it can only be compared with a good crop of swedes, to which it is thought superior for these reasons; it will grow on land that is not kind for turnips, or where it is difficult to obtain a good plant;—it will stand a dry summer better, it will grow a greater weight per acre, it may be cleared from the ground earlier, and may be stored easier, it will fatten equally well as a swede, and not exhaust the land so much. With respect to the ensuing crop, it is supposed to come in the place of a turnip crop, it is therefore best followed by barley; but as it is off the ground early, the land may be sown sometimes with advantage with wheat; that would, however, be interfering with the regular course. Its effect on the land is the same as that of any other crop that is carried clean off, consequently the following crop cannot be so good as would be expected after turnips fed on the land: to obviate this in some measure, it is recommended to plough the tops in as manure, which if the land had a proper coat of dung at the time of ploughing will be found sufficient for the barley.

4. The weight of a crop of mangold wurzel varies so much that it is difficult to state the probable quantity of average crops; it is, however, as compared with swedes, a fair statement to say, that on the same land, with equal manure, and each an average, it is the heavier crop of the two, whether it be fifteen, twenty-five, or thirty, or more, tons per acre. Taken on the whole, it is considered by the Norfolk farmers as a great acquisition, and quite requisite to have a portion of the turnip course appropriated to the growth of this plant every year.

MANURES.

Animal and vegetable matters introduced into the soil to accelerate vegetation and increase the production of crops are termed manures. They have been used since the earliest periods of agriculture. But the manner in which manures act, the best modes of applying them, and their relative value and durability, were little understood till the time of Sir H. Davy, from whose invaluable lectures on agricultural chemistry, we are chiefly indebted for the information which this article embraces.

As different manures contain different proportions of the elements necessary to vegetation, so they require a different treatment to enable them to produce their full effects in agriculture. In describing the various manures, their nature and properties, and the best mode of preserving and applying them, Sir Humphrey Davy divides them into three distinct classes, vegetable, animal, and mineral:—

1. *Manures of vegetable origin.*

All *green succulent plants* contain saccharine or mucilaginous matter with woody fibre and readily ferment. They cannot, therefore, if intended for manure, be used too soon after their death.

When green crops are to be employed for enriching a soil, they should be ploughed in, if it be possible, when in flower, or at the time the flower is beginning to appear, for it is at this period that they contain the largest quantity of soluble matter, and that their leaves are most active in forming nutritive matter. Green crops, pond weeds, the paring of hedges or ditches, or any kind of fresh vegetable matter, require no preparation to fit them for manure. The decomposition slowly proceeds beneath the soil, the soluble matters are gradually dissolved, and the slight fermentation that goes on, checked by the want of a free communication of air, tends to render the woody fibre soluble, without occasioning the rapid dissipation of elastic matter.

When old pastures are broken up and made arable, not only has the soil been enriched by the death and slow decay of the plants which have left soluble matter in the soil, but [illegible]ves and roots of the grasses living at the time and occupying so large a part of the

surface, afford saccharine, mucilaginous, and extractive matters, which become immediately the food of the crop, and the gradual decomposition affords a supply for successive years.

Rape Cake, which is used with great success as a manure, contains a large quantity of mucilage, some aluminous matter, and a small quantity of oil. This manure should be used recent, and kept as dry as possible before it is applied. It forms an excellent dressing for turnip crops, and is most economically applied by being thrown into the soil at the same time with the seed. Whoever wishes to see this practice in its highest degree of perfection, should attend Mr. Coke's annual sheep-shearing at Holkham.

Malt Dust consists chiefly of the infant radicle separated from the grain. Like rape dust it should be used as dry as possible, and its fermentation prevented.

Sea Weeds, consisting of different species of fucialgæ and confervæ, are much used as a manure on the sea coasts of Britain and Ireland. This manure is transient in its effects, and does not last for more than a single crop, which is easily accounted for from the large quantities of water or elements of water it contains. It decays without producing heat when exposed to the atmosphere, and seems as it were to melt down and dissolve away; large heaps have been destroyed in less than two years, nothing remaining but a little black fibrous matter.

Dry Straw of wheat, oats, barley, beans, and peas, and spoiled hay, or any other similar kind of dry vegetable matter is in all cases useful manure. In general such substances are made to ferment before they are employed, though it may be doubted whether the practice should be indiscriminately adopted.

When straw is made to ferment it becomes a more manageable manure; but there is likewise on the whole a great loss of nutritive matter. More manure is perhaps supplied for a single crop, but the land is less improved than it would be supposing the whole of the vegetable matter could be finely divided and mixed with the soil.

Mere woody fibre seems to be the only vegetable matter that requires fermentation to render it nutritive to plants.

Inert peaty matter is a substance of the same kind. It remains for years exposed to water and air without undergoing change, and in this state yields little or no nourishment to plants. Lord Meadowbanks states that one part of dung is sufficient to bring three or four parts of peat, into a state in which it is fitted to be applied to land; but, of course, the quantity must vary according to the nature of the dung and of the peat. In cases in which some living vegetables are mixed with peat, the fermentation will be more readily effected.

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2. *Manures of animal origin.*

Manures from animal substances in general, require no chemical preparation to fit them for the soil. The great object of the former is to blend them with the earthy constituents in a proper state of division, and to prevent their too rapid decomposition.

By covering dead animals with five or six times their bulk of soil, mixed with one part of lime, and suffering them to remain for a few months; their decomposition would impregnate the soil with soluble matters, so as to render it an excellent manure, and by mixing a little fresh quick lime with it at the time of its removal, the disagreeable effluvia would be in a great measure destroyed; and it might be applied in the same way as any other manure to crops.

Fish forms a powerful manure in whatever state it is applied, but it cannot be ploughed in too fresh, though the quantity should be limited. Mr. Young records an experiment in which herrings spread over a field, and ploughed in for wheat, produced so rank a crop that it was entirely laid before harvest.

Amongst oily substances, *blubber* has been employed as a manure. It is most useful when mixed with clay, sand, or common soil, so as to expose a large surface to the air; the oxygen of which produces soluble matter from it. Lord Somerville used blubber with great success at his farm in Surrey. It was made into a heap with soil, and retained its powers of fertilizing for several successive years. Mr. Howeas, at Crowborough, in Sussex, has also employed blubber very extensively on the forest lands in that neighbourhood. The excellent crops now produced upon what a few years since might in fact be deemed a *barren waste*, affords ample testimony of the great advantages resulting from the proper application of this kind of manure.

Bones.

The employment of bones as a means of enriching the soil, is one of the most important discoveries that have been made in modern times, as regards the operation of manures, for it affords us the means of employing, in the most beneficial manner, a substance which would otherwise be useless. Much valuable information with respect to the application of bones as a manure, is to be found in the Report of the Doncaster Agricultural Association, from which the following extracts are selected.

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"The returns received by the Association satisfactorily establish the great value of bones as a manure. The experiments on manure in this varying climate are not much to be depended on; the seasons, whether wet or dry, the previous state of the land, and the component parts of it, all tend to make experiments doubtful in their comparative results, yet where a course of practice so long established as the use of bones, has furnished such a number of experiments, all doubts may at once be discarded. Our correspondents, with only two * exceptions, all concur in stating them to be a highly valuable manure, and on light dry soils, superior to farm-yard dung, and all other manures. In copying the language of one† of them, with reference to dry sandy soils, we express the opinions repeated in a far greater number: "I consider bone tillage one of the most useful manures which have ever been discovered for the farmer's benefit, the lightness of carriage—its suitableness for the drill, and its general fertilizing properties, render it peculiarly valuable in those parts where distance from towns render it impossible to procure manures of a heavier and more bulky description:"‡ for, as stated by another, the carting of six, eight, or ten loads of manure per acre, for one mile only is no trifling expense. The use of bone diminishes labour at a season of the year too, when time is of the first importance, for one waggon load of 120 bushels of small drill bones, is equal to 40 or 50 cart-loads of fold manure. Upon very *thin sand land*, its value is not to be estimated: it is not only found to benefit the particular crop to which it is applied, but extends through the whole course of crops, and even in the succeeding courses, its effects are visible in the improved quality of the land, and the efficiency of a smaller quantity than would at first have ensured a crop.

On the *dry lime-stone*, near Doncaster, the same favourable results have been obtained, and no failures beyond those attributable to peculiarity of season are noticed.

On the *light loams* the reports are favourable, giving a preference to the ordinary dressing of farm-yard dung.

On the heavy loams and clays, the experiments are unfavourable.

It is laid down as a necessary qualification in a soil for bone, that it should be dry.

We are upon this principle authorized to infer that clay soils are in general too moist to receive any considerable benefit from bone tillage.

Upon *peat soils*, observing the principle that they must be laid dry, the advantages of bone manure are reported to be very striking. From fifteen to twenty bushels of dust per acre, drilled, have been found to surpass very far the ordinary dressing of farm-yard dung, and even lime, or pigeon's-dung. Upon the fallows, the general time of applying them is previously to or at the same time with the turnip seed, in May, June, July, and August. For the intermediate crops, the bones will be applied with seed.

The next point of enquiry is, the manner in which they are best used; this embraces as well the method of putting them into the land, by drilling or broadcast after they are prepared, as also the best manner of preparation, whether broken, large, or small.

First, then, as to the drilling or broadcasting, the great weight of evidence is in favour of drilling; although the contrary course is held by some very intelligent farmers. A third mode is acted upon by others, of sowing them broadcast, and gathering them into ridges with a mould plough. Mr. Workman prefers broadcast for barley, and the Rev. Mr. G. Wright, and Mr. Weldon prefer broadcast for the white turnips, although in other cases they give the preference to the drill.

In their preparation a decided preference seems to be given to bones broken small, and the half-inch bones are those most generally used. Mr. Birks states; "If I were to till for early profit, I would use bones powdered as small as saw-dust, if I wished to keep my land in good heart, I would use, principally, half inch bones, and in breaking these I should prefer some remaining considerably larger." Reasons for this belief are thus stated by Mr. Woodcock:—"By using bones of a large size, with dust in them, I think I have sufficient of the small particles of the dust to set the turnip crop forwards, and sufficient of the large particles of the bone left to maintain the land in good condition for the last crop."

In endeavouring to ascertain what may be deemed a fair ordinary dressing of bone manure, we should avoid on the one hand those who are more than ordinarily liberal, as well as those who are much less so.

The best judgment we can come to upon the facts before us, warrants our conclusion that an ordinary dressing of bone tillage, broken down to the smallest size above dust, is twenty-five bushels, and of the half-inch and inch bones, forty bushels, that this would be the quantity requisite on land of ordinary quality, and in an ordinary state of cultivation, the poorer or worse cultivated lands, requiring a greater quantity, and those in a higher state of cultivation or richer, a less. As the results of the investigation of this association it appears that,

On dry sands, limestone, chalk, light loams, and peat, bones are a very highly valuable manure.

They may be laid on grass with great good effect.

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* Tweedale, Overman.

† Henry Pilkington.

‡ Raynes.

On arable lands they may be laid on fallow for turnips, or used for any of the subsequent crops.

That the best method of using them when broadcast is, previously to mix them up with earth, dung, or other manures, and let them lie to ferment.

That if used alone they may either be drilled with the seed, or sown broadcast.

That bones which have undergone the process of fermentation are decidedly superior to those which have not done so.

That the quantity should be about twenty-five bushels of dust, or forty bushels of large, increasing the quantity if the land be impoverished.

That upon clays and heavy loams, it does not yet appear that bones will answer.

Horn is a still more powerful manure than bone, as it contains a larger quantity of decomposable animal matter. The animal matter in them seems to be of the nature of coagulated albumen, and it is slowly rendered soluble by the action of water. The earthy matter in horn, and still more that in bones, prevents the too rapid decomposition of the animal matter, and renders it very durable in its effects.

Hair, *woollen rags*, and *feathers*, are all analogous in composition, and principally consist of a substance similar to albumen united to gelatine. The theory of the operation is similar to that of bone and horn shavings.

The refuse of the different manufacturers of *skin* and *leather* form very useful manures, such as the shavings of the currier, furrier's clippings, and the offals of the tan yard and of the glue maker. The gelatine contained in every kind of skin is in a state fitted for its gradual solution or decomposition, and when buried in the soil, it lasts for a considerable time, and constantly affords a supply of nutritive matter to the plants in its neighbourhood.

Blood contains certain qualities of all the principles found in other animal substances, and is consequently a very good manure.

Urine is very liable to change and to undergo the putrefactive process; and that of carnivorous animals more rapidly than that of graminivorous animals. In proportion as there is more gelatine and albumen in urine, so in proportion does it putrefy more quickly.

The species of urine that contain most albumen, gelatine, and urea, are the best as manures; and all urine contains the essential elements of vegetables in a state of solution.

During the putrefaction of urine the greatest part of the soluble animal matter that it contains is destroyed, it should consequently be used as fresh as possible; but if not mixed with solid matter, it should be diluted with water, as when pure it contains too large a quantity of animal matter to form a proper fluid nourishment for absorption by roots of plants. Putrid urine abounds in ammoniacal salts, and although less active than fresh urine, is a very powerful manure.

Night Soil, it is well known, is a very powerful manure, and very liable to decompose. It differs in its composition, but always abounds in substances composed of carbon, hydrogen, azote, and oxygen. From the analysis of Berzelius, it appears that a part of it is always soluble in water; and in whatever state it is used, whether recent or fermented, it supplies abundance of food to plants.

The disagreeable smell of night soil may be destroyed by mixing it with quick lime, and if exposed to the atmosphere in thin layers strewed over with quick lime in fine weather, it speedily dries, is easily pulverised, and in this state may be used in the same manner as rape-cake, and delivered into the furrow with the seed.

The Chinese who have more practical knowledge of the use and application of manures than any other people existing, mix their night soil with one-third of its weight of a fat marle, make it into cakes and dry it by exposure to the sun. These cakes we are informed by the French missionaries, have no disgreeable smell and form a common article of commerce of the empire. The earth by its absorbent powers probably prevents, to a certain extent, the action of moisture upon the dung, and likewise defends it from the effects of air.

After night soil, *pigeon's dung* comes next in order as to fertilizing power. It is evident that this manure should be applied as new as possible; and when dry, it may be employed in the same manner as the other manures capable of being pulverized.

The dung of *cattle*, *oxen*, and *cows*, has been chemically examined by M. M. Einhof and Thaer. They found it contained matter soluble in water, and that it gave in fermentation, nearly the same products as vegetable substances absorbing oxygen and producing carbonic acid gas.

If the pure dung of cattle is to be used as a manure, like the other species of dung which have been mentioned, there seems no reason why it should be made to ferment except in the soil, or if suffered to ferment it should be only in a very slight degree, the grass in the neighbourhood of recently voided dung is always coarse and dark green. Some persons have attributed this to a noxious quality in unfermented dung; but it seems to be rather the result of an excess of food furnished to the plants.

The question of the proper mode of application of the dung of horses and cattle, however, properly belongs to the subject of composite manures, for it is usually mixed in the farm yard with straw, offal, chaff, and various kinds of litter, and itself contains a large proportion of fibrous vegetable matter.

A slight incipient fermentation is undoubtedly of use in the dung-hill, for by means of it a decomposition is brought on in the woody fibre to decay and dissolve, when it is carried to the land or ploughed into the soil; and woody fibre is always in great excess in the refuse of the farm.

Too great a degree of fermentation is, however, very prejudicial to the composite manure in the dung-hill; it is better that there should be no fermentation at all before the manure is used, than that it should be carried too far. The excess of fermentation tends to the destruction and dissipation of the most useful part of the manure. It is a common practice amongst farmers, to suffer the farm-yard dung to ferment, till the fibrous texture of the vegetable matter is entirely broken down, and till the manure becomes perfectly cold, and so soft as to be easily cut by the spade.

Independent of the general theoretical views unfavourable to this practice, founded upon the nature and composition of vegetable substances, there are many arguments and facts which show that it is prejudicial to the interests of the farmer. During the violent fermentation which is necessary from reducing farm-yard manure to the state in which it is called *short muck*, not only a large quantity of fluid, but likewise of gaseous matter is lost; so much so, that the dung is reduced one half or two thirds in weight, and the principal elastic matter disengaged, is carbonic acid, with some ammonia; and both these, if retained by the moisture in the soil, as has been stated before, are capable of becoming an useful nourishment of plants.

Besides, the dissipation of gaseous matter, when fermentation is pushed to the extreme, there is another disadvantage in the loss of *heat*, which if excited in the soil, is useful in promoting the germination of the seed, and in assisting the plant in the first stage of its growth, when it is most feeble and most liable to disease; and the fermentation of manure in the soil must be particularly favourable to the wheat crop, in preserving a genial temperature beneath the surface late in autumn, and during winter.

Again, it is a general principle in chemistry, that in all cases of decomposition, substances combine much more readily at the moment of their disengagement, than after they have been perfectly formed; and, in fermentation beneath the soil, the fluid matter produced is applied instantly, even whilst it is warm, to the organs of the plant, and consequently is more likely to be efficient than in manure that has gone through the process; and of which all the principles have entered into new combinations. Mr. Coke has entirely given up the system formerly adopted on his farm, of applying fermented dung; and his crops have been since as good as they ever were, and his manure goes nearly twice as far.

A great objection against slightly fermented dung is, that weeds spring up more luxuriantly where it is applied. If there are seeds carried out in the dung, they certainly will germinate; but it is seldom that this can be the case to any extent, and if the land is not cleansed of weeds, any kind of manure fermented or unfermented, will occasion their rapid growth, If slightly fermented, farm yard dung is used as a top-dressing for pastures; the long straws, and unfermented vegetable matter remaining on the surface, should be removed, as soon as the grass begins to rise vigorously, by raking, and carried back to the dunghill; in this case no manure will be lost, and the husbandry will be at once clean and economical.

In cases where farm yard dung cannot be immediately applied to crops, the destructive fermentation of it should be prevented as much as possible.

The surface should be defended as much as possible from the oxygen of the atmosphere, a compact marle, or tenacious clay, offers the best protection against the air, and before the dung is covered over, or as it were sealed up, it should be dried as much as possible. If the dung is found at any time to heat strongly, it should be turned over, and cooled by exposure to air.

If a thermometer plunged into the dung does not rise above 100 degrees of Fahrenheit, there is little danger of much aeriform matter flying off. If the temperature is higher, the dung should be immediately spread abroad.

When a piece of paper moistened in muriatic acid, held over the steam arising from a dung-hill gives dense fumes, it is a certain test that the decomposition is going too far, for this indicates that volatile alkali is disengaged.

When dung is to be preserved for any time, the situation in which it is kept is of importance. It should if possible be defended from the sun. To preserve it under sheds would be of great use; or to make the site of a dung hill on the north side of a wall. The floor on which the dung is heaped, should if possible be paved with flat stones, and there should be a little inclination from each side towards the centre, in which there should be drains connected with a small well, furnished with a pump, by which any fluid matter may be collected for the use of the land.

It too often happens that a dense mucilaginous and extractive fluid is suffered to draw away from the dunghill, so as to be entirely lost to the farm.

Street and *road dung*, and the *sweepings of houses* may be all regarded as composite manures; the constitution of them is necessarily various, as they are derived from a number of different substances. These manures are usually applied in a proper manner without being fermented.

Soot, which is principally formed from the combustion of pit-coal or coal, generally con-

tains likewise substances derived from animal matters. This is a very powerful manure; it affords ammoniacal salts by distillation, and yields a brown extract to hot water of a bitter taste. It likewise contains an empyreumatic oil. Its basis is charcoal in a state in which it is capable of being rendered soluble by the action of oxygen and water. This manure is well fitted to be used in the dry state, thrown into the ground with the seed, and requires no preparation.

The doctrine of the proper application of manures, from organized substances, offers an illustration of an important part of the economy of nature and of the happy order in which it is arranged.

The death and decay of animal substances, tend to resolve organized forms into chemical constituents, and the pernicious effluvia disengaged in the process, seems to point out the propriety of burying them in the soil, where they are fitted to become the food of vegetables. The fermentation and putrefaction of organized substances in the free atmosphere, are noxious processes; beneath the surface of the ground they are salutary operations. In this case the food of plants is prepared where it can be used; and that which would offend the senses, and injure the health, if exposed, is converted by gradual processes into forms of beauty and of usefulness; the fetid gas is rendered a constituent of the aroma of the flower, and what might be poison, becomes nourishment to animals and to man.

3. *Manures of mineral or fossil origin.*

Lime.—Quick lime in its pure state, whether in powder or dissolved in water, is injurious to plants. But lime in its state of combination with carbonic acid, is a useful ingredient in soils. Calcareous earth is found in the ashes of the greater number of plants; and exposed to the air, lime cannot long continue caustic, but soon becomes united to carbonic acid.

When newly-burnt lime is exposed to air, it soon falls into powder; in this case it is called slacked lime, and the same effect is immediately produced by throwing water upon it, when it heats violently, and the water disappears.

Slacked lime is merely a combination of lime, with about one third of its weight of water, i.e. fifty-five parts of lime, absorb seventeen parts of water; and in this case it is composed of a definite proportion of lime to a definite proportion of water, and is called by chemists *hydrate of lime*; and when hydrate of lime becomes carbonate of lime by long exposure to air, the water is expelled, and the carbonic acid gas takes its place.

When lime, whether freshly burnt or slacked, is mixed with any moist, fibrous, vegetable matter, there is a strong action between the lime and vegetable matter, and they form a kind of compost together, of which a part is usually soluble in water.

By this kind of operation, lime renders matter which was before comparatively inert, nutritive, and as charcoal and oxygen abound in all vegetable matters, it becomes, at the same time converted into carbonate of lime.

Mild lime, powdered limestone, marles or chalks, have no action of this kind upon vegetable matter, by their action they prevent the too rapid decomposition of substances already dissolved; but they have no tendency to form soluble matters.

It is obvious, from these circumstances, that the operation of quick-lime and marle or chalk, depends upon principles altogether different. Quick-lime, in being applied to land, tends to bring any hard vegetable matter that it contains into a state of more rapid decomposition and solution, so as to render it a proper food for plants. Chalk and marle, or carbonate of lime will only improve the texture of the soil, or its relation to absorption; it acts merely as one of its earthy ingredients. Quick-lime, when it becomes mild, operates in the same manner as chalk, but in the act of becoming mild, it prepares soluble out of insoluble matter.

It is upon this circumstance that the operation of lime in the preparation for wheat crops depends, and its efficacy in fertilizing peats, and bringing into a state of cultivation all soils abounding in hard roots, or dry fibres, or inert vegetable matter.

Gypsum (Sulphate of Lime) has been used with great success in America, and with advantage in some parts of Kent. It is principally applicable to Saintfoin and other artificial grasses.

Salt.—The utility of salt as a manure, and for other agricultural purposes, is a subject of such great importance and extent, that it will require a separate notice at our hands, the reader is therefore referred to the article Salt.

"*Saltpetre.* *—The salt, Nitrate of potash, called also saltpetre or nitre, is a natural production of the earth's surface, and abounds in Syria, Africa, Hindostan, Naples, and Spain. In the neighbourhood of Madrid, it is formed in artificial beds prepared for that purpose from the scrapings of the streets of that capital, by the mere action of the atmosphere. From these beds it is washed with water, and the solution of saltpetre afterwards crystallized by exposure in shallow vessels to the sun and wind, when the crystals of saltpetre are spontaneously formed.

The crystals of salt which exude from the brick walls in stables and farm-yard buildings, are composed entirely of this salt, in fact saltpetre is formed in all situations where animal matter during putrefaction has access to potash. But the exact chemical explanation is a problem which has hitherto puzzled all the chemical philosophers, although even a Davy

* Communicated by Cuthbert Wm. Johnson, Esq.

devoted himself to the investigation, with all his wonted talents, and zealous perseverance.

Saltpetre is usually imported into this country in a crude or rough state: it is purified for the purposes of commerce, from the common salt, &c. which it usually contains, by recrystallizations and washing with water; and is also when melted by heat in an iron ladle, and run into moulds, known under the name of Sal Prunella. For the use of the farmer, however, the impure or crude nitre is every way the cheapest, and may always be procured at the best hand, at about twenty-five to thirty-five shillings per hundred weight.

Saltpetre, as usually met with in commerce, is composed of

Nitric acid (Aquafortis)	45.92
Potash	54.08
	100.

It is usually in crystals of six-sided prisms; and, when employed as a fertilizer, is generally sown by hand in this state, or is reduced to powder, by pounding or rolling.

It is universally admitted by those who have used it at the rate of one hundred weight per acre, to be productive of the most luxuriant effects, and to retain an advantageous influence upon the soil, for at least two years.

Its beneficial operation upon plants is most probably by stimulating their absorbent vessels; and it is also a direct food, being found in many plants in very sensible proportions. Of this kind are the common sun-flower, nettle, borage, pellitory, &c. which will not flower well in any soil from which saltpetre is absent. M. Bullion caused seeds of the sun-flower to vegetate in a sandy soil, totally free from nitre: on examining the plants, not the slightest trace of saltpetre could be discovered; but upon watering the soil with a weak solution of this salt it speedily made its appearance in the usual proportion.

In illustration of the beneficial effects of saltpetre upon various crops we subjoin the following statements:

THE USE OF NITRE UPON GRASS LANDS.

Mr. William Lightfoot, of Little Gaddesden, in Hertfordshire, has used saltpetre regularly for the last five years.

His farm of nearly 600 acres, contains almost every variety of gravel, upon a substratum of chalk. He sows the saltpetre by hand, (it being previously finely powdered) at the rate of 1 cwt. per acre. On meadow lands its effects are admirable, and *especially upon clover and all other artificial grasses*. He considers the produce of grass lands thus manured, to be increased full one fourth. The colour of all his crops has been rendered a much deeper green by its use; and he has found that when his grass-fields have been partially folded with sheep, and the remainder manured with saltpetre at the above rate, that the land thus fertilized has been fully equal in produce of grass to that on which the sheep had been confined. He considers it a superior manure to any other for all kinds of grasses. Its effects upon tares are equally admirable. He has not thought of *varying* the quantity of one hundred weight per acre, since that proportion has invariably answered so well. He considers it a *much* superior manure to bone dust, and that its good effects are maintained for *two years*.

WHEAT.

Mr. William Lightfoot, of Little Gaddesden, has used saltpetre at the rate of 1 cwt. per acre, sown by the hand after being finely pulverized, in February, March, or April, with the most decided advantage. It not only renders the wheat plant of a much deeper green, when growing, but renders it some inches taller. The saltpetred wheat is so much greener than that not so treated, as to be clearly distinguishable by its colour, at a considerable distance. He has some years used more than one hundred pounds worth of saltpetre in his wheat and spring crops.

Mr. Lightfoot saltpetred one year a field of twenty-six acres, partly wheat and the remainder oats, and by way of comparison left a part of both the wheat and oats without saltpetre. The colour of this portion was so very inferior, says Mr. Lightfoot, that it might be clearly distinguished from the saltpetred portions "a mile off."

I think it would be well to apply the saltpetre at an earlier period than even February—say as soon as the wheat is well out of the ground, for (as I have ascertained with regard to common salt by actual experiment) there is little or no danger of its being washed out of the soil by the winter's rain, &c.

Mr. Robert Newton, of Preston Crowmarsh, in Oxfordshire, tried saltpetre to a considerable extent in March, 1829, upon wheat growing upon a fine loam, after red clover.

He applied 2 cwt. per acre, mixed with the same quantity of coal-ashes. It cost him 25s. per cwt.

The saltpetred wheat in ten days looked very superior to the other portion of the same field, but no care was taken at harvest-time to ascertain the comparative produce, and thus much time and expense was wasted, and the result very uncertain.

I cannot impress this fact too much upon the farmers attention, for the appearance of even a crop of saline manured wheat, I have, in another place, shewn to be no correct indication of the actual produce of a crop; and it is most probable that saltpetre is not different in this effect from salt.*

* See Article Salt—Chapter on Wheat.

BARLEY AND OATS.

Mr. William Lightfoot, of Little Gaddesden, has used saltpetre at the rate of 1 cwt. per acre, or sometimes 10 cwt. to 9 acres of barley and oats, with the most decided success. It makes a very considerable addition to the quantity of straw, and while vegetating, is several shades deeper green than that not saltpetred. The effects of the application are much more visible in dry than in very moist seasons. His land is a light gravel.

TURNIPS.

Mr. William Lighfoot, of Little Gaddesden, has used saltpetre for turnips, 1 cwt. per acre with the seed, or after it was harrowed in, with the most satisfactory result.

In the year 1826, one acre of a field of turnips did very nearly as well as the remaining nine acres manured with farm-yard compost. The soil of Mr. Lightfoot's farm is very gravelly.

In conclusion, let me exhort every friend of agricultural improvements, to examine the value of saltpetre as a fertilizer—it is a still more portable manure than even common salt, and in all probability there are many soils, especially of the better heavy kind to which saltpetre may be even more advantageous than salt; and it yet remains to be proved how the mixture of the two, especially on the light barley soils of Norfolk, might operate. Say in the fproportion of a quarter of a hundred weight of saltpetre per acre, with ten or twelve bushels of common salt I am persuaded that great advantage might in this way be produced, since I have heard of very successful results from the application of *saltpetre* at the rate of 1 cwt. per acre, when at the same time I know that the *saltpetre* contained three parts in four common salt, being merely the residual salt of the saltpetre refiners."

COMPOSTS.

These furnish a supply of manure when a sufficiency of animal dung cannot be obtained, and when applied as dressings, are of the greatest utility to the farmer. Unslacked lime, road soil, scourings of ditches, dung, quick roots gathered from the land, fern, leaves of trees, and earth of different kinds, are the substances generally employed. In every instance the ingredients of which a compost is formed should be well mixed together, and the heap frequently turned, that fermentation may be promoted.

On examining the properties of the different composts usually employed as dressings for the soil, we find one abounding in *calcareous* and *alkaline* parts, deficient in the *oleaginous* and *carbonaceous* principles; another in which the *oleagmous* quality is predominant, deficient in alkali and carbon; a third, in which the *alkali* and *carbon* prevail, with a deficiency in the oleaginous parts; and of a long series, perhaps the fabrication would be found to be the work rather of blind chance than of any effort of real judgment. Hence it is easy to perceive that the artificial manures are oftener than otherwise applied in an improper manner, originating in error, and pregnant with uncertainty of operation, they must in many cases, doubtless, tend to the deterioration of the soil, instead of its melioration.

Mature investigation has discovered the *oleaginous*, *alkaline*, and *carbonaceous* principles to be the basis, or extractable qualities of all vegetable substances and consequently the food of plants, to which must be added the natural assistants, air and water. From such a result, says the author of 'A Dissertation on the Nature of Soils, &c.' " the composition of a universal compost, seems to us practicable, but the main consideration was, how to unite the proper quantity of these ingredients into the form of food for plants, and this difficulty being obviated, a compost has eventually been formed to supply the vegetable kingdom with nourishment and support.

The universal compost is not intended to supersede the use of dung; but we can assure the intelligent agriculturist with some degree of confidence, that it will supply the deficiency of that necessary and useful article in those districts where dung cannot be obtained in sufficient quantity for the use of agriculture, which is the case throughout the United Kingdom, except, perhaps, the immediate vicinity of the metropolis, and other large towns.

And further, we can state as a positive fact, that this substitute can be obtained at about *one-sixth part of the expense of dung*; which will ensure a saving to the farmer of *from five to six pounds per acre*, in dressing his land.

It is a misfortune which accompanies many attempts to enlarge the circle of science, that men are with difficulty persuaded to deviate from the course to which they have been accustomed; the general use of this or that particular mode of practice, furnishes in too many instances, an argument for rejecting even the consideration of improvement, and the injudicious agriculturist blunders on in the beaten track of his ancestors, being in some of his operations perfectly right without knowing why he is so, and in others egregiously wrong, yet unable to detect the cause of his error.

By chemically examining the component parts of dung, it is found to be composed of an *unctuous fat principle*, an *alkaline salt*, and a certain proportion of *carbonaceous matter*, which nature has united in one mass by putrefaction: it is these qualities united by a natural process, that render dung a proper ingredient in all the appropriated manures, being suited *to all sorts of soil*, as well as adapted to all *sorts of crops*, for these principles are essentially necessary to supply the *vegetable world with food*.

Now all these qualities are equally present in the universal compost, as they are in dung itself; consequently it is adapted *for the food of vegetables*, and to convince the practical agriculturist of the truth of this assertion, requires only a trial of the artificial manure, which can be procured at a trifling expense.

THE UNIVERSAL COMPOST.

The proportion of materials intended to dress one acre of land:—

50lbs. of vegetable alkali, viz. English potash.—(Where English cannot be obtained in sufficient quantity, the inferior Russian or American ashes may be used in its stead.)

86lbs. of the oleous or fat substance, viz. four gallons of common oil.

112lbs. of mineral alkali (muriate of soda), viz. two bushels of common salt.

50lbs. (or thereabouts) of quick-lime, viz. one bushel in quantity.

Throw the lime into a tub or cistern, made for the purpose, to which add a sufficient quantity of water to slack it; dissolve the alkali in about twelve gallons of water, which add to the lime and mix: then add the oil, and incorporate the whole together; after which sprinkle this compound with a watering pot, on a sufficient quantity of absorbent earth, or vegetable mould; that is to say, from 45 to 50 bushels, that the earth may imbibe these ingredients: during this imbibition, add the salt, and mix the whole together, and after it has lain some time, it will be fit for use.

This quantity of compost is to be spread over the surface of one acre of ground, in the form of a top-dressing; it will allow something more than a peck, containing one pound and a half of vegetable food to each rod.

From the extreme simplicity in making the universal compost, the moderate expence at which it can be obtained, and the benefit it will confer on mankind; its general use in foreign countries, as well as in every part of the British empire, may with moral certainty be anticipated.

Expence of the materials to dress one acre:—

	£	s.	d.
Fifty lbs. of English potash alkali, at 17s. or 18s. per cwt. - - - - - - - - - - - - - - -	0	8	0
Four gallons of oil, the oleaginous principle, at 3s. per gallon. - - - - - - - - - - - - - -	0	12	0
Two bushels of salt (muriate of soda), at 7s. per sack	0	3	6
One bushel of quick-lime, at 6d. per bushel - - - -	0	0	6
Expence per acre - - - -	1	4	0

The universal compost is a great fertilizer of the soil, as appears from the sudden increase of vegetable crops after its application; and when applied to meadow land, it produces an early and vigorous vegetation. But what renders this compost more deserving the attention of the agriculturist, is its comparative freedom from seed-weeds. From the quantity of alkaline salts it possesses, there is every reason to believe that wheat, and other kinds of grain, would by the use of it become less subject to disease than at present, by preventing the mildew, and by being a destroyer of the slug, the grub, and the wire-worm, and every description of underground vermin, as well as the ova of that pernicious insect, the fly, which proves so destructive to the turnip husbandry."

MARJORAM.

Marjoram (*Origanum*), Didynámia Gymnospérmia, Linn.; and Labiátæ, Juss.

There are four species of Marjoram cultivated.

1. Sweet summer or knotted marjoram, (*Origanum Marjorana,*) a hardy biennial, a native of Portugal. In this country it is treated as an annual.
2. Pot Marjoram, (*Origanum Onites*) }
3. The Winter or Sweet Marjoram, (*Origanum Heracleoticum*) } All hardy perennials.
4. The Common or Wild Marjoram, (*Origanum Vulgare*) }

Culture, &c.

SOIL.

The first three varieties prefer a light, dry, unexhausted soil; the last a calcareous soil

Propagation.

The sweet, or knotted Marjoram, is always raised from seed. "Sow in April, on a compartment of light earth, either in small drills, or broadcast, and rake in the seed. Or sow a portion in a hot-bed, if requisite to have a small crop forwarder. When the plants are one, two, or three inches high, thin the seed-beds and plant those thinned in a final bed, six inches apart, giving water: or where larger supplies are required, some may remain thick where sown to be drawn off by the root as wanted. Take the crops green in summer and autumn. It is usual to gather a supply for winter.

All the Perennials may be raised from seed sown in March or April; or they may be propagated by off-sets, slipping, or parting the roots, in Spring or Autumn, which are to be planted from eight to twelve inches asunder. They will grow freely, and increase in stocky bunches, furnishing green tops for use all summer and autumn. The winter marjoram will afford tops in winter, or a store gathered in summer, (July or August,) may be dried to keep for winter."—*Abercrombie.*

Use.

All the sorts are aromatics of sweet flavour, and much used in soups, broths, stuffings, &c.

MAPLE.

Maple (*A'cer Campéstre*), Polygámia Monœ'cia, Linn.; and Aceríneæ, Juss.

The Maple is indigenous to this country, and is chiefly cultivated for ornamental purposes.

Culture, &c.

Soil.

Will grow in almost any soil, but thrives best in dry situations.

Propagated.

By seed, which is sown, raised, and cultivated in every respect the same as the Sycamore.—See *Sycamore.*

Use.

The wood on account of its lightness, is used to make musical instruments, and some parts of machinery, but is chiefly employed by coopers.

MEASURE,

Although the subject of Weights and Measures is in itself a very interesting one, yet being with reference to the design of this work of limited application, we should not have considered it necessary to introduce it here, had it not been for the new system very recently adopted by the legislature. That system has, we apprehend, met with few cordial approvers among the class of persons for whom our labours are especially designed; because few have been able duly to appreciate the magnitude of the evil it was intended and is fully calculated to remove; and consequently they have not generally been inclined to balance the permanent good against the temporary inconvenience arising from the change.

Whoever duly considers the vast importance, in a commercial country, of a well regulated system of weights and measures,—of one founded on the immutable standards of nature, and therefore containing in itself the means of correcting the tendency which the habits of mankind have to introduce diversity, will feel grateful that the skilful persons to whom the reform was intrusted, have deemed it practicable to steer a middle course between complete confusion and entire innovation. The British legislature adopted the recommendation of scientific and practical men; and instead of attempting (like our gallic neighbours) what was manifestly impracticable, have removed the irregularities of the existing system, and at the same time retained and secured its basis.

Measure, in its most comprehensive sense, is distinguishable into six kinds.*

1. Length.	3. Solidity or Capacity.	5. Angles.
2. Surface.	4. Force of Gravity, or Weight.	6. Time.

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* See the Companion to the Almanac, for 1829, or the British Almanac for 1830.

Of these, the *second* has already been considered under the article ACRE; we propose to confine ourselves here, to the *third* kind, which consists of three *divisions*.

Division 1.—SOLIDITY; wherein 1728 cubic inches make a cubic foot, and 27 cubic feet make a cubic yard.

Division 2.—Imperial measure of CAPACITY for all liquids, and for all dry goods, except such as are comprised in the third division.

			Cubic.*		Cylindrical.	French litres.	Pounds of water.
4 Gills	make	1 *Pint*	34·659	inches	44·129	·56793	1¼
2 *Pints*	—	1 *Quart*	69·318	inches	88·259	1·1359	2½
4 *Quarts*	—	1 *Gallon*	277·27	inches	353·04	4·5435	10
2 *Gallons*	—	1 *Peck*	554·55	inches	706·07	9·0869	20
4 *Pecks*	—	1 *Bushel*	2218·2	inches	2824·3	36·348	80
		Ditto	1·2837	feet	1·6344		
8 *Bushels*	—	1 *Quarter*	10·269	feet	13·075	290·78	640
5 *Quarters*	—	1 Load	51·347	feet	65·377	1453·9	3200

Only those denominations which are printed in *italics* are recognized by the Act, a circumstance to be particularly noted, as a contract not made with reference to the legal denominations, (for instance, to deliver a certain number of *loads* of wheat, without adding "at 5 quarters to the load") cannot be legally enforced.—See the LAW Appendix.

Division 3.—Imperial measure of CAPACITY for coals, culm, lime, fish, potatoes, fruit, and other goods, commonly sold by *heaped measure*.

2 *Gallons*	make	1 *Peck*	703·87	cubic inches.
8 *Gallons*	—	1 *Bushel*	2815·49	—
3 *Bushels*	—	1 *Sack*	4·8888	cubic feet.
12 *Sacks*	—	1 *Chaldron*	58·656	—

Measures for dry goods, not heaped, may be of any form, but those for heaped goods must be cylindrical, the outside diameter being at least double the depth, and the goods heaped up in the form of a cone, to a height above the rim of the measure, of at least three fourths of the depth.

The smallest diameter of heaped measures therefore must be,—the bushel 19½ inches—half bushel 15½—peck 12¼—gallon 9¾—half gallon 7¾.

TABLE FOR REGULATING THE DIMENSIONS OF THE IMPERIAL BUSHEL FOR STRIKE MEASURE.

Diameter		Depth.		Variation	Diameter		Depth.		Variation	Diameter		Depth.		Variation
in.	16ths	in.	16ths	1 Bushel	in.	16ths.	in.	16ths.	1 Bushel	in.	16ths	in.	16ths.	1 Bushel
13¾		14	15	in 120	15	6	11	15	in 96	17		9	12	in 78
13	14	14	11	117	15½		11	12	94	17	2	9	10	77
14		14	7	115	15	10	11	9	93	17¼		9	8	76
14	2	14	3	113	15¾		11	6	91	17	6	9	6	75
14¼		13	15	111	15	14	11	3	90	17½		9	4	74
14	6	13	11	109	16		11	1	88	17	10	9	1	73
14½		13	7	107	16	2	10	14	87	17¾		8	15	72
14	10	13	3	106	16¼		10	11	86	17	14	8	13	71
14¾		13	0	104	16	6	10	9	84	18		8	12	70
14	14	12	12	102	16½		10	6	83	18	2	8	10	69
15		12	9	100	16	10	10	3	82	18¼		8	8	68
15	2	12	6	99	16¾		10	1	80	18	6	8	6	67
15¼		12	3	97	16	14	9	15	79	18½		8	4	66

In the first column is found the inner diameter of the measure, in inches and 16ths of an inch; the second gives the corresponding depth; and the third shews the allowance which ought to be made for every eighth of an inch, by which the depth of any measure exceeds or falls short of the depth shewn in the table.

Example—If a bushel be 14¾ inches in diameter, the Table shews that it ought to be 13 inches in depth, and if a measure of this diameter be found only 12⅞ in depth, the allowance for such variation ought to be one bushel in 104; that is, 104 such measures would only contain 103 bushels.

Proportions between the Old and New Measures of Capacity.

1. The imperial measure is *greater* than the old wine measure in the proportion of 6 to 5 nearly; therefore

* In all these columns, the Figures that follow the *points* are decimals.

To reduce { old quantities / new prices } into { new quantities / old prices } deduct *one sixth* part.
To convert { new quantities / old prices } into { old quantities / new prices } add *one fifth* part.

The imperial measure is *greater* than the old corn measure in the proportion of 33 to 32 nearly; therefore

To reduce { old quantities / new prices } into { new quantities / old prices } deduct *one thirty-third* part.
To convert { new quantities / old prices } into { old quantities / new prices } add *one thirty-second* part.

3. The imperial measure is as nearly as possible the same as the old coal measure, the excess being only one part in 4938.

4. The imperial measure is *less* than the old beer measure, in the proportion of 59 to 60 nearly, therefore

To convert { old quantities / new prices } into { new quantities / old prices } add *one fifty-ninth* part.
To reduce { new quantities / old prices } into { old quantities / new prices } deduct *one sixtieth* part.

As the corn measure will be the object of greatest interest to our readers we conclude with the following:

TABLE TO CONVERT QUANTITIES FROM THE OLD INTO THE NEW STANDARD.

[Note, 8 gallons make 1 bushel; 8 bushels one quarter.]

Old.	New Mea.			Old.	New Mea.			Old.	New Mea.			Old.	New Mea.			Old	New Mea.		
Qrs.	Qrs.	Bu.	Gal	Qrs	Qrs.	Bu.	Gal	Qrs	Qrs.	Bu.	Gal	Qrs.	Qrs.	Bu.	Gal	Qrs	Qrs	Bu.	Gal
1	0	7	6	23	22	2	3	45	43	5	0	67	64	7	5	69	86	2	2
2	1	7	4	24	23	2	1	46	44	4	6	68	65	7	3	90	87	2	0
3	2	7	2	25	24	1	7	47	45	4	4	69	66	7	1	91	88	1	6
4	3	7	0	26	25	1	5	48	46	4	2	70	67	6	7	92	89	1	4
5	4	6	6	27	26	1	3	49	47	4	0	71	68	6	5	93	90	1	2
6	5	6	4	28	27	1	1	50	48	3	6	[illegible]	69	6	3	94	91	1	0
7	6	6	2	29	28	0	7	51	49	3	4	73	70	6	1	95	92	0	6
8	7	6	0	30	29	0	5	52	50	3	2	74	71	5	7	96	93	0	4
9	8	5	6	31	30	0	3	53	51	3	0	75	72	5	5	97	94	0	2
10	9	5	4	32	31	0	1	54	52	2	6	76	73	5	3	98	95	0	0
11	10	5	2	33	31	7	7	55	53	2	4	77	74	5	1	99	95	7	6
12	11	5	1	34	32	7	6	56	54	2	3	78	75	4	7	100	96	7	4
13	12	4	7	35	33	7	4	57	55	2	1	79	76	4	6	200	193	7	1
14	13	4	5	36	34	7	2	58	56	1	7	80	77	4	4	[illegible]	290	6	5
15	14	4	3	37	35	7	0	59	57	1	5	81	78	4	2	400	387	6	2
16	15	4	1	38	36	6	6	60	58	1	3	[illegible]	79	4	0	500	484	5	6
17	16	3	7	39	37	6	4	61	59	1	1	83	80	3	6	600	581	5	3
18	17	3	5	40	38	6	2	[illegible]	60	0	7	84	81	3	4	700	678	4	7
19	18	3	3	41	49	6	0	63	61	0	5	85	82	3	2	800	775	4	4
20	19	3	1	42	40	5	6	64	62	0	3	86	83	3	0	900	872	4	0
21	20	2	7	43	41	5	4	65	63	0	1	87	84	2	6	1000	969	3	5
22	21	2	5	44	42	5	2	66	63	7	7	88	85	2	4				

MEDLAR.

Medlar (*Méspilus Germánica*), Icosándria Di-Pentagy'nia, Linn.; and Rosáceæ. Juss.

The Medlar is a native of the south of Europe, but appears to be naturalized in some parts of England. There are three varieties in cultivation:

1. *The Dutch Medlar.* Flower and fruit very large.
2. *The Nottingham Medlar.* The fruit of a more poignant taste.
3. *The Wild Medlar.* The leaves, flowers, and fruit of this variety are smaller than the above.

Culture, &c.

Soil.

A rich loam and rather moist situation, with a deep bottom, seems best adapted for the medlar.

Propagated.

By seeds, layers, cuttings, or by grafting on seedlings of its own species, the latter is the most eligible mode.

Pruning.—The fruit is produced on small natural spurs, at the ends and sides of the branches. Standards require only occasional pruning; remove all dead or cankery wood, irregular and redundant shoots, keeping the middle and general branches moderately open.

Taking the Crop.—The fruit should be gathered in October or November when full grown, laying it on shelves or on a dry floor, so that the medlars do not touch each other. When matured they will be soft, the pulp brown, resembling that of a decayed apple.

Use.

The fruit when in a state of incipient decay is employed for the dessert, and from its peculiar flavour, is a favourite with many.

MELON.

The Melon (*Cúcumis mélo*), Monœ'cia Monodélphia, Linn.; and Cucurbitáceæ, Juss.

The varieties of melons are very numerous, every gardener has his favourite sorts, suitable for the purposes for which he grows them; some prefer large showy melons, and others prefer small high-flavoured ones. Small melons are almost always best flavoured, and for the most part the greatest bearers. The English melons most in cultivation are:—

1. Brazilian	11. Orange Cantaloup	21. Hardy Ridge
2. Bucharian	12. Citron	22. Hardy Scarlet-fleshed
3. Early Cantaloup	13. Scarlet-fleshed Netted	23. Levant
4. Early Rock	14. Pine Apple	24. Golden Rock
5. Early Polignac	15. Green Fleshed	25. Scarlet Rock
6. Black Rock, Large	16. ——— Egyptian	26. Silver Rock
7. ——— Small	17. ——— Italian	27. Romana
8. ——— Lord Vernon's	18. Netted Succada	28. Scarlet-fleshed, Smooth
9. Montague Cantaloup	19. Valentia, or Winter	22. Green-fleshed IonianCantaloup.
10. Netted Cantaloup	20. Nutmeg	

Estimate of sorts.—The Montague Cantaloup, Pine Apple, Green-fleshed, Scarlet Rock, and Scarlet-fleshed, are the highest flavoured; but of these, as well as the others, many very indifferent sub-varieties are in cultivation in consequence of sufficient care not being paid to keep them from being impregnated while in flower, by others of more indifferent properties. It is a difficult matter to procure good seed in the first instance, and difficult to continue it good, particularly where many sorts are grown in the same garden. Two or three good varieties are as many as should be cultivated where the flavour of the melon is an object; and when once procured, should be carefully preserved. The varieties of the cucumber have already been given under the article Cucumber, which see.

Cultivation and general Management of the Melon and Cucumber.

The beginning of January is a very good time to commence the rearing of these plants for an early crop, but for general purposes, the first of February, or even the first of March, will be more suitable. It has been observed by a practical writer on this subject, that beginning before the first of January is striving hard against the stream to no purpose. If preparations were made the end of December, or the first week in January, so as to sow the seeds by the second or third week in the month, the success will be generally greater than by sowing a month or even six weeks earlier. Cucumbers and melons are forced in a variety of ways; some gardeners preferring common hot-beds others dung pits in their different modifications, and not a few have of late years grown them in pits heated by steam.

In preparing to cultivate cucumbers and melons, either upon beds composed of dung only, or of fagots to be heated by means of dung linings, it will be necessary, in the first place, to prepare dung wherewith to form a seed-bed. For this purpose, such a quantity of good fresh dung should be procured as will be sufficient, after being well fermented, to form a bed about five or six feet wide and three and a half or four feet long, and about five feet in height at the back, and four at the front, upon which to place a one-light frame,

which will be sufficient for the purpose of rearing seedling cucumbers and melons for any ordinary family. The seeds may be sown in small pots or shallow pans filled with rich light mould, and covered to the depth of two inches and placed upon the surface of the bed. As the heat rises, the pots or pans may be either plunged deeper or still kept upon the surface, as the heat of the bed may indicate.

The temperature of the seed-bed should be kept up to from 65 to 75 deg. Fahrenheit; but the variation of a few degrees is not of that importance which is usually attached to it, indeed the plants will not hurt in any temperature varying from 60 to 80 deg., provided the transitions from both extremes do not occur too frequently, and at the same time too suddenly. As the plants appear above ground, if the mould in the pots appear to be dry, give them a little water that has stood for some hours in the bed, or which has been brought to a temperature equal to that of the bed, or nearly so, but be careful not to give too much at a time. If the heat in the bed becomes too violent, then, if the pots or pans have been partly or wholly plunged, draw them up a little, or take them up altogether and stand them upon the surface until the bed declines in heat; without this precaution, the roots of the plants would be liable to be destroyed by too much heat. As the plants begin to grow, admit air in a sufficient quantity at all times into the bed, to guard against drawing the plants up weakly, and remove the mats as soon after sun-rise in the morning as possible, to give the plants as much of its invigorating influence as possible.

When the plants are a little advanced, with the seed leaves about half an inch broad, which they should be in five or six days after their first appearance; they are then fit for being transplanted into nursery pots to acquire sufficient strength to be afterwards planted out on the bed where they are intended to produce their fruit.

Before proceeding to plant them into nursery pots, it will be necessary to have the pots and a sufficient quantity of rich dry light mould, chiefly decomposed dung from an old hot-bed, and vegetable mould, well decomposed, carrying the dung before it is to be used into the frame, that the whole may be of equal temperature, for the young plants to experience as slight a check as possible in their removal from the seed pot to that of the nursing or succession one; which pots should be about three and a half to four inches diameter at top, and as much in depth. Let the pots be filled with about one half with the earth, then turn the young plants carefully out of the seed-pot, breaking the fibres as little as possible. Place three plants in each pot, close to the sides, so that their young leaves may rest upon the top of the pot; then cover their roots with the mould, carefully rubbing it fine with the hand, and filling the pots nearly up to the brim. The deeper the young plants are placed into the pots now, the better, for they will push out roots all the way up the stem, from the original roots as far as the surface mould in the pot. The mould should be dry, and, in filling it in, not by any means pressed, but put in quite loose, and the whole should have a gentle watering over head with a fine rose watering pot, which should be constantly kept in the frames at this season full of water, that it may be of a temperature as near that of the atmosphere of the frame as possible. This being done, stir up the surface of the bed and replace the pots, either plunged or half plunged, according to the state of the heat, in the bed. Keep up a brisk heat, by means of linings round the sides of the bed, so that the temperature within may be kept to about 60 or 65 deg. in the night, and a few degrees higher in sunshine. The great objects to guard against at this season are, too much rank steam, and an excess of heat or cold. Air should be admitted as freely as the weather will permit, that the plants may not be drawn up too weakly. The bed should not only be examined morning and evening, but also once or twice throughout the day, until the plants get a little stronger; if the roots be in danger of being destroyed by too much heat, take the pots up a little; and if too cold, plunge them a little deeper into the bed.

As soon as the first seeds are above ground, a few more should be sown as a substitute in case of accidents; and this second sowing should also be succeeded with a third, and so on.

By the end of January the plants will be fairly established in these nursing pots, that is, if the seed were sown about the first of the month. As soon as they have formed two rough leaves, the bud that is to produce the shoots or runners will appear between the two leaves, this embryo shoot should be taken out, either with the point of a knife, or carefully pinched out with the finger and thumb, but so as not to injure the leaves of the plants. This shortening or stopping as it is called, will render the plants more stocky and strong, and will cause the emission of a number of other shoots, which will be more prolific; and they in their turn, when stopped, will not fail to shew plenty of fruit; whereas, if this first shoot were allowed to proceed without stopping, they would probably run two or three feet without shewing fruit, and would be both sterile and slender.

By the end of the first, or beginning of the second week in February, the plants will most probably be fit for planting out into the beds in which they are to perfect their fruit; however, if the plants should be weak, slender, or long-stemmed, owing to an excess or deficiency of heat, or insufficiency of air, they should not be transplanted out until they are quite strong and stocky, for it will be far better to defer their final transplanting until they are perfectly strong; which, with good management, may be easily effected by the end of February. Throughout their whole culture the plants most rapidly grown are always the

best, and will produce not only the finest fruit, but also the greatest quantity. Beds for the reception of the plants after they are removed from the seed-bed, must next be prepared. By the beginning of February, the dung of which the beds are to be formed should be got in readiness; that is, it should be duly prepared by repeated turning and fermenting, giving it plenty of water should it be dry in the first instance, or heat-dry in the process. The materials of which such beds should be built ought to be of the very best quality, and if leaves are to be had, one-third or even one-half of them should be added. They most generally give out a more lasting and more regular heat than beds built of dung alone. As the plants appear strong enough for ridging out, beds should be prepared for them of the following dimensions:—For cucumbers their height at the back should not be less at this season than four feet and a half, and three and a half in front. The beds being thus finished, and the heat sufficiently high, they are then in a fit state for earthing over, to form the hills for the reception of the plants.

Before laying on the mould, take off the frame and lights, and level the surface equally over if much sunk into irregularities in the process of heating. The whole being regulated, and the frame and lights being replaced, proceed to cover the whole surface of the bed with rich dry light mould, which for this purpose it is presumed has been prepared during the summer, and a portion of it placed under cover, so as to be dry and ready for use when wanted. The thickness that this mould should be put on need not be more than two or three inches. Under the centre of each light place on a little hill about one bushel of the mould, upon which the plants are to be planted as soon as the heat is sufficiently up, so as to warm the mould in the hills to a sufficient temperature. The higher these hills are kept the better, so as to admit of sufficient space for the plants, in order that they may not touch the glass.

The beds being thus finished, they will in two or three days be fitted for the reception of the plants. The strongest and most stocky of which should now be chosen, and having been previously watered, should, in the next place, be carefully turned out of the pots and planted in the hills; one pot of plants, viz. three plants will be sufficient for each hill; draw the mould gently round their stems, and let them be planted rather deep than otherwise, giving the hills a gentle watering with a fine rose watering pot sufficiently to settle the mould round the roots of the plants.

The process of planting or ridging out being thus finished, shut up the lights till the steam rises again strong enough to require to be let out by degrees.

Both cucumbers and melons thrive better in a humid high temperature than one that is dry, however warm it may be; therefore the more they can be supplied with that heat and humidity, the more likely are we to be successful in their production. Care must be taken to supply the plants with air every day, in a greater or less quantity, as the state of the beds may determine.

The principal object now to be attended to, is to support a constant steady growing heat in the bed, so as to keep the plants from sustaining any check in their growth. It will therefore be necessary to attend carefully to the heat of the bed, and when the first symptom of its decline appears, let linings of prepared hot-dung be applied, so as to restore it to its proper heat.

For the first three or four weeks after planting out, great attention should be paid that the roots of the plants sustain no injury from over heats. To guard still more effectually against such accidents, many persons place a piece of turf under the hills before they are formed, and this precaution may be attended to as the trouble is not great; the hills may also be reduced as much as possible, leaving them just sufficient basis to stand upon without danger of falling. In this state they may remain till all danger of burning is over, when the mould may be again replaced, to form the hills of their original size. In the course of eight or ten days the young roots will be beginning to show themselves all round the hills; this is looked upon as the first symptom of the plants being in a state of progressive welfare. When such roots appear, let a little mould be laid over them to the thickness of three quarters of an inch, or an inch and a half at most. Such mould should be of the same quality as that of which the hills are formed, and for this purpose should have been in the bed for a day or two, so as to have attained a temperature equal to that of the rest of the mould in the frame. It is well not to put too much of this mould round the roots at once, a little only should be put on at a time, and that often repeated.

In three or four weeks from the time of planting out the cucumber plants, one, two, or three shoots will probably be formed; which, as they advance, should be stopped, by pinching off the point of each shoot a little above the second eye, or bud; this will cause them to throw out lateral shoots, or buds, and from the first or second joints of such lateral shoots, fruit will probably show; when they must again be stopped by pinching off the vine with the finger and thumb one eye or joint beyond the fruit, and in the future management of the plant the same attention must be paid to stopping *every branch* where fruit is observed; by this simple plan the centre of the plant is always kept in a thriving and a bearing state.

As the vines (as they are technically termed) or runners proceed in their growth, they must be neatly and regularly trained down to the surface of the mould by small hooked pegs, to retain them in their respective places and keep them close to the mould, so that

as they advance, they may emit roots to strengthen themselves and afford nourishment to the fruit. When it becomes necessary to remove any misplaced or crowded shoots pinch them neatly off with the finger and thumb in preference to using a knife.

Setting the fruit is the next operation, which is always performed as soon as the female blossoms appear; these will be readily distinguished from the male flowers, the former always having at their base the rudiments of the future fruit, the latter having no such appendages, but merely a simple flower containing the stamina, or male parts of fructification. At the time of fructification watch the plants daily, and as soon as a female flower and some male blossoms are fully expanded, proceed to set the fruit the same day, or the next morning at farthest. Take off a male blossom, detaching it with part of the foot stalk; hold this between the finger and thumb, pull away the flower leaf close to the stamens and anthera or central part, which apply close to the stigma or blossom of the female flower, twirling it a little about to discharge thereon some particles of the fertilizing powder. Proceed thus to set every fruit as the flowers of both sorts open, while of a lively full expansion, and generally perform it in the early part of the day, using a fresh male, if possible, for each impregnation, as the males are usually more abundant than the female blossoms. Cucumbers attain the proper size for gathering, in about fifteen, eighteen, or twenty days from the time of setting; and often in succession for two or three months or more in the same bed, by good culture. The small flowers are often plucked wholly off as useless, under a notion of strengthening the plant; but their agency being absolutely necessary in fertilizing the females, they should only be displaced as they begin to decay, except where they are superabundant. The fruit is cut and gathered when from five, six, or eight inches long, according to its kind, for it is in the greatest perfection for the table while young and green.

The directions hitherto given as regards the sowing, potting off, and ridging out of cucumbers, are also applicable to melons; with this difference only, that beds for the latter fruits should be built at least a foot higher, aud a brisker heat kept up during their whole culture. The melon requires a minimum heat of about 65 deg. Fahrenheit from the time of germination till that of fructification, and a heat of about 75 degrees to fructify in. As the shoots extend themselves they should be stopped at the third or fourth joint, by which means lateral shoots will be emitted, on which *alone* the fruit is produced. Mr. Nicols, of Newick-place, however, prefers stopping the shoots as they reach the edge of the frame; at the same time he allows only three vines to each plant, or nine branches to each hill, from which fruitful laterals are abundantly produced. A certain portion of mould should be added as the roots begin to make their appearance through the hills, and as it is progressively applied should be well beaten or trodden as solid as possible, but care must be taken in doing this that the roots be neither bruised nor broken. When melons begin to show fruit, great attention should be paid them that the office of impregnation be not neglected; for although cucumbers will sometimes, even at the earliest period of the season, come to tolerable perfection without this assistance, and often afterwards, melons will not set freely at any period without it; and should they occasionally set and swell to an ordinary size, they never will acquire that beauty or flavour which they would if impregnated; they also go off when half grown, and will always be deformed and without flavor.

As the fruit increases to the size of a walnut, place a flat tile, slate, or a small piece of glass under each to protect it from the dampness of the earth. The interval between the setting of the fruit and perfect maturity, is generally from thirty to forty days. As the fruit becomes nearly ripe, only a small quantity of water must be given, but air must be freely admitted; for without these points be attended to, the flavour of the fruit will be indifferent. The vines also may be thinned out considerably, but not until the whole of the fruit be just on the eve of ripening; for if done sooner, it will give too sudden a check to the plants, and cause many, probably the whole of the fruit, to ripen prematurely and become shrivelled and insipid.

Ripe melons are distinguished by their full size, sometimes by their turning a yellowish colour, more constantly by imparting an agreeable odour, often by the base of the foot-stalk, close to the fruit cracking in a little. On these indications of maturity the fruit should be cut before too mellow or dead ripe, that it may eat with a lively sharp flavour. The morning is the best time for cutting the fruit.

A second crop from the old plants is often obtained by pruning the old stools, whereby new laterals are sent out, which by proper management sometimes afford a second crop almost as productive as the first. Mr. Harrison, however, objects to this practice, and prefers raising new plants from fruitful cuttings to the old system of pruning; his process is thus detailed in the sixth volume of the Horticultural Transactions:—

" When the first crop of fruit is nearly gathered, I take off cuttings from the old plants. The cuttings which I select are those extremities of shoots which are shewing the most small fruit. They are cut off the second advanced joint from the top. The leaves are taken off, and each cutting thus prepared is ready for insertion. I put two cuttings into each pot, and insert them, placing them close to the side of the pot, and filling the pots with light rich soil, gently shaking it upon the cuttings. The pots used are twenty-fours. After being watered, I place the pots in a small one-light frame, a hot bed having been

previously prepared under it a sufficient time to allow the burning heat to subside before the bed is thus used. I cover the bed to the depth of eight or ten inches with moderately dry soil; in this the pots with their cuttings are plunged up to the rim. The frame is then kept close for four or five days in order to retain the steam, which is very essential in supporting the cuttings until they strike root. The frame is also shaded for some time during four or five hours in the middle of the day. Care is also taken that the heat is not so intense at the bottom of the pots as to burn the cuttings. In about a week the cuttings, if properly managed, will have struck root, this will be shown by their shoots pushing.

The first crop of melons having been gathered from the old plants, I take out the soil in which they have grown, and replace it with some new, to the depth of twelve inches. The beds are also at the same time lined with fresh dung. In about ten days from the time of inserting the cuttings they will be ready to plant out, and having prepared the original beds as here described, I turn out one pot of cuttings entire, under each small three-light frame, to each three-light frame I allow two pots, one to each end light. When the plants have pushed about fourteen inches, I pinch off the end of each shoot to cause them to produce fresh runners. The fruit which had shown previous to the cuttings being taken from the old plants, will, after the cuttings are finally planted out, swell very rapidly, and in three weeks after the bed has been replanted I have cut abundance of fine fruit, some weighing seven or eight pounds each, varying in this according to the kind. The plants also yield abundantly, being much more productive and healthy than if they were old plants cut in the usual manner. I have uniformly gathered of the second crop from twelve to twenty fruit in each light.

A considerable advantage belonging to this plan is that the plants never run to length, they need no more stopping than already described, nor do they require any thinning of the shoots. I have also to observe, that it often happens in melon plants not raised from cuttings, that the stems near the roots will crack, and when water is poured upon such places, it causes the plants to perish, but this is never the case with those raised as above described."

Melon plants at all times, particularly when approaching to maturity, are subject to the attacks of that minute but destructive enemy the red spider. Wherever the temperature is high, and water withheld for any length of time, it is almost sure to make its appearance, in which case the following methods may be put in practice:—"Get plenty of horse dung thrown up in a large heap, turn it over once or twice, shaking and mixing it well, and let it lie till its rankness be somewhat evaporated, and if there be linings at the beds take them away entirely; examine the dung of the beds and see if it be wet and has a bad smell, take a sharp-pointed stake and make holes all round in the sides of the beds into their centre, in such a slanting way that the water may easily run out of them; then make a strong lining of the prepared dung all round the beds, and by occasional augmentations keep up the linings nearly to a level of the surface of the earth in which the plants grow. As soon as the linings have cast a strong heat into the beds, scatter some flowers of sulphur all over the plants, and keep as strong a heat in the frames as the plants can bear, a heat of 120 deg. will not destroy them if the steam of the linings be prevented from getting in among the plants. Water the plants all over the leaves about once a week with clean water, 100 deg. warm, and if the sunshine keep the lights close shut down all day, and cover them up in the evening, leaving a little air all night at each light, to prevent a stagnation of air among the plants. Continue this process till the mildew or insects disappear and the plants appear to grow freely, and afterwards manage them in the usual way, taking care to keep up a good strong heat in the linings. This method sets the stagnated bed in a fermentation, which makes the moisture run out of it, and dries it so that water given to the plants has free liberty to pass off. If the linings do not heat the air in the frames sufficiently, let some of the earth in the inside all round the sides of the boards be removed, to let the heat of the linings rise freely in the frame.—(*Abridged chiefly from M'Intosh's Practical Gardener.*)

MINT.

Mint (*Méntha*), Didynámia Gymnospermia, Linn.; and Labiátæ, Juss.

The mints are hardy indigenous perennial plants, of which the following species are generally cultivated.

1. Spearmint, (*Mentha Viridis*).
2. Peppermint, (*Mentha Piperita*).
3. Pennyroyal Mint, (*Mentha Pulegium*).

Culture, &c.

SOIL.

Spearmint and Peppermint like a moist soil. Pennyroyal a stiff loam.

Propagation.

All the species are raised by parting the roots, by offsets, and by cuttings of the stalks.

1. *By roots.*—This is performed in spring or autumn. Having some full roots, from long established beds, divide them as expedient; and drawing drills with a hoe, about two inches deep and six inches asunder, place the roots in the drills moderately close, and earth them over to an equal depth.

2. *By offsets,* in the spring.—When the young plants are from two to six inches in growth, draw them up with the roots to each set, plant them, by dibble, in rows six inches asunder.

3. *By cuttings of the young stalks,* in May, June, or advanced summer.—Taking the opportunity of showery weather, cut them into lengths of five or six inches, and plant the cuttings, by dibble, six inches apart, inserted half way into the earth. Water well, and repeat the waterings in dry weather, till the cuttings strike.

After-culture.—Propagated as above, the young plants set in spring or summer will come into use the same year. Keep them free from weeds and insects, and at the end of autumn cut away any remaining stems, at which season, or in spring, spread a little loose earth thinly over the bed.

New Plantations.—All the species continue by the roots many years; but when the plants shoot dwindling, or weakly, make a fresh plantation in time.

Taking the crop.—The spearmint, for culinary use or salads, may be gathered both when the young green tops are from one inch to six inches in length, and in their advanced growth throughout the summer. When beginning to flower, gather a store for winter; spread the heads thinly, in some dry place, shaded from the sun, to be well dried, then, tied in bunches, house the store. When designed for distilling, let them attain full growth, coming into flower; then cut and use immediately.

Peppermint and pennyroyal being principally used for distilling, should stand till they begin to flower, being then in the highest perfection. Cut them in dry weather, tie them in bunches, and carry under cover, ready for immediate use. Cut half-grown stalks close at the bottom."—*Abercrombie.*

Use.

1. Spearmint is chiefly cultivated for its leaves and tops, which are used in spring salads, and forms an ingredient in soups; it is also employed to give flavour to certain dishes, as peas, &c.

2. Peppermint yields on distillation an essential oil, which is principally used as a carminative and antispasmodic. The distilled water is a domestic remedy for flatulent colic.

3. Pennyroyal is sometimes employed for culinary purposes, and is occasionally distilled.

MULBERRY.

Mulberry (*Mórus Nígra*), Monœ'cia Tetrándria, Linn.; and Urtíceæ, Juss.

The black mulberry produces both male and female blossoms upon the same tree. The male blossoms are contained in an amentum or catkin; the females in a roundish head.

Culture, &c.

Soil.

The mulberry succeeds best in a light rich earth or a deep sandy loam, with a free exposure to the sun.

Propagated.

By layers, cuttings, or grafting.

1. *By Layers.*—Layers of the young shoots are taken either of young trees formerly headed down to the bottom to form stools, to furnish lower shoots near the earth for laying, or of the lower branches of the trees not headed; having pots of earth elevated on stands nearly up to the branches, and laying the shoots therein. They will be well rooted in autumn, after one summer, and should then be planted in a nursery, where they are to be trained to a single stem, unless designed to be formed into espalier or wall trees. In four years they will be fit for final removal in the places where they are to remain.

2. *By cuttings.*—Miller says, " mulberry cuttings will strike well if planted in a hot-bed in spring. Knight failed in thus raising cuttings, but was very successful by the following process:—He cut vigorous shoots from the trees in November, and formed them into cuttings about five inches long, each consisting of about two parts of two-years' old wood, and one part of yearling wood. They were intended to be put in pots, and the bottom of each cutting was cut so much a-slope, that its surface might be nearly parallel

with that of the bottom of the pot in which it was to be placed. The cuttings were then placed in the common ground, under a south wall, and so deeply immersed in it, that one bud only remained visible above its surface; and in this situation they remained till April. At this period the buds were much swollen, and the upper ends of the cuttings appeared similar to those of branches which had been shortened in the preceding autumn, and become incapable of transmitting any portions of the ascending fluid. The bark of the lower ends had also begun to emit those processes which usually precede the production of roots. The cuttings were now removed to the pots to which they had been previously fitted, and placed in a moderate hot-bed, a single bud only of each cutting remaining visible above the mould, and that being partially covered, and in this situation they vegetated with so much vigour, and emitted roots so abundantly, that I do not think one cutting in a hundred would fail with proper attention. The mould employed was the alluvial and somewhat sandy loam of a meadow, which was sparingly supplied with water, and the plants till they had become sufficiently rooted, were shaded during bright weather.

It is now understood that the mulberry, like many varieties of the apple, may be propagated with great facility by *large cuttings*. The recorded fact, that at Bruce Castle, near Tottenham, Middlesex, an immense branch being torn off by the wind from an old mulberry tree many years since, that the branch was thrust into the ground and flourished, *and is now a handsome tree*, is a corroborative evidence that "a cutting from a tree which has borne fruit, will soon become a vigorous plant."

3. *By Grafting*.—Knight having planted some young mulberry trees in pots, raised them to the bearing branches of old trees, and grafted them by approach. The grafts bore fruit the third year, and continued annually productive. The tree succeeds very ill by the common mode of independent grafting.—(*Hort. Trans.* i. 60.)

TREE.

1. *Mode of bearing and pruning*.—The mulberry produces its fruit on the young yearling shoots from the wood of the preceding year, as well as the spurs of the two-year old wood.

2. *Season for pruning*.—As the blossom-buds cannot be readily distinguished from others in the winter; the best period for pruning is the spring, when the blossoms first become visible.

3. *Pruning of standard trees*.—Beyond the removal of irregular and cross branches, standards require but little pruning.

4. *Pruning and training wall and espalier trees*.—The mulberry succeeds better than any other tree when trained downwards, either horizontally and drooping, or in the stellate manner.

In pruning pinch off every barren shoot which is not wanted to cover the wall, and stop every bearing shoot, under similar circumstances, at the third or fourth leaf. Williams has correctly stated that the bud immediately below the point at which a bearing or other branch is pinched off, usually affords fruit in the following year. Mr. Nicols, of Newick-place, prefers training in the horizontal manner, the branches being a foot apart, these are never shortened but allowed to grow to their full length. The system of pruning by *spurring* in a manner similar to that of the pear is practised by Mr. N. His trees, which are planted in an eastern aspect, are very prolific, and the fruit certainly remarkably fine, and of a superior quality.

USE.

The fruit is chiefly employed for the dessert, and from its cooling and laxative properties, is occasionally used for medicinal purposes, in the form of syrup.

MUSHROOM.

Mushroom (*Agáricus campéstris*) Cryptogámia Fúgi, Linn. and Fúgi, Juss.

Mushrooms are very extensively cultivated in this country, and are by many considered a delicious article of food. They are propagated by seed, and in favourable seasons are found in great abundance in fields, old pastures, and downs. From the many accidents that have occurred from eating spurious sorts of mushrooms, great caution should be observed in the gathering of them, for even the edible garden mushroom when grown in certain places possesses deleterious qualities.

Mushrooms growing in woods, or by the side of hedges, are seldom safe. Those growing in open old pastures should be preferred, and from such situations the mushrooms are supposed to be much more delicate in

flavor, and tender in flesh, than those which are grown in artificial beds. Young or button mushrooms grown on beds are, however, firmer and better for pickling than those of the same size growing naturally. In using cultivated mushrooms there is evidently less risk in having the deleterious kinds intermixed, as the persons employed in cultivating them are more correct in their judgment between the wholesome and the deleterious sorts.

CULTIVATION OF MUSHROOMS.

Spawn.—In the cultivation of mushrooms spawn is the first thing required; it is defined by Abercrombie, Neill, and others, to be a white fibrous substance, resembling broken threads, and is found running in dry reduced dung, or any other nidus favourable to its existence. These threads, when put into action in a favourable situation, produce small tubercles attached to them by lateral threads, in the manner of potatoes. Spawn of the true *Agaricus campestris*, or eatable mushroom, smells exactly like that of the mushroom, and this is the test generally applied by gardeners to ascertain its genuineness.

Spawn is often purchased by gardeners from nurserymen, who, to supply their demands, make annually a great quantity of it. It is sold in the shape of bricks, and varies in price according to the demand and other circumstances.

Indigenous spawn may be collected in September in old pasture lands. It is also often found in the path of a bark-mill worked by horses, or in any other horse-mill track under shelter, in temporary sheds in which horses are fed and take occasional shelter in winter, in dry dung heaps, and in old hot beds. Having found the pieces of dung which contain the desired spawn, take them up as entire as possible, and lay them carefully in a basket or any other conveyance; these are to be stored till used, in any dry convenient place; and if they be found in a damp state, they should be dried before they are laid together in a mass. The dry spawn may be preserved for years, but to preserve it from running or perishing before it be planted, it is absolutely necessary to keep it in a dry place, through which there is a current of air.

Artificial spawn may be procured by the following process, which has been recommended by a successful cultivator of mushrooms, in the Memoirs of the Caledonian Horticultural Society.

In the month of March, when the cattle are fed principally on dry food, collect two parts of cow dung, one part of sheep, and one of horse dung; dry them well and break them into small pieces.

When well mixed together, lay them up in a round heap, finishing the top into a point; let the heap be well trodden whilst it is building, which will prevent it from heating too much. This operation must be carried on in a dry place, in some shed or old house. Thrust a stick into the heap when finished, and by drawing it out at any time the heat can be ascertained. If, upon examining the stick, it feels slightly warm, then the heat is going on well. Care must be taken in this particular, for in the whole culture of mushrooms by this or any other means, they are equally impatient of either too much heat, moisture, or cold. The best temperature for them seems to be from 55 to 60 deg. of Fahrenheit. When the heap is in a slight state of fermentation, cover it with about four or six inches of straw. If the operation be carried on in a warm shed, then a single old bass-mat will be sufficient; but this must be regulated by the state of fermentation in the heap.

When the heap has been a month or five weeks in this state, examine it by thrusting in the hand to the middle of the heap; and if the spawn have began to run, it may be distinguished by the appearance of many small white fibres or threads running through the dung, and this is the real spawn. If there be no appearance of spawn, cover the heap up again, and add two or three inches of droppings fresh from the stable. This, when again covered over as at first, will set the whole in moderate fermentation, and at the end of another four weeks the whole will be a mass of spawn, provided that the fermentation has not been allowed to exceed the temperature above stated. Sometimes it will make its appearance sooner, and by this means excellent spawn is produced. Spawn procured in this manner should be used soon after making, as it will lose its strength by long keeping.

Artificial spawn may also be produced by collecting the droppings of horses fresh from the stable, and after being partly dried may be put up in any dry corner of a shed, mixed with a small portion of light sandy earth that is quite dry. If this remains undisturbed for two or three months, the whole mass will be full of spawn.

In this case, also, fermentation must not be allowed to exceed the temperature before mentioned, viz. 60 deg. of Fahrenheit's thermometer.

MAKING MUSHROOM BEDS.

The spawn being procured, the next consideration is to make ready a bed on which to plant it. Many plans have been adopted for the cultivation of mushrooms on beds, which have been attended with greater or less success; the general methods practised by gardeners who grow a considerable quantity for the London markets, are perhaps the oldest and at the same time the best. These beds are made in the open air, in some convenient spot, and are

in the form of a ridge or triangle, the base of which is generally the longest side. In gardens where neatness and regularity is required, the melon ground will be found the best situation.

For winter crops, beds may be made in any spare shed or old building, and it may be observed, that although September is the month generally chosen for putting up mushroom beds, they may be made with success at almost any other time of the year. When beds are made in sheds they are apt to get too dry in the summer, in the open ground the humidity of the air keeps them in a state sufficiently damp without the necessity of often giving them water, which is a very delicate point in their culture. If it were possible to keep them sufficiently damp by covering them from the sun and winds, and exposing them to very slight showers, or rather heavy dews, it would be desirable, as watering, however carefully done, is apt to run upon the surface and render some part of the bed too damp, while others are too dry.

The principal objection to beds made in the open air is, that they are troublesome to cover and to protect from frost and wet; but beds made in sheds also often require to be covered, in the same manner.

The advantages they possess, on the other hand, are important, as the mushrooms produced on ridges are considered in Covent Garden market as decidedly superior to those grown on shelves or boxes in houses, being both more heavy and juicy, and always bring the highest price.

About a fortnight or three weeks before the beds are to be put up, provide a quantity of fresh horse dung; let it be well shaken and mixed, and put up in a heap to purge it of its fiery heat, let it be turned over once a week, or oftener, and at each turning well mixed, so that every part of the dung may be equally fermented, and deprived of its noxious quality. When the dung is in a fit state to be made into a bed, let the bottom be marked out about seven feet wide, and as long as it is judged necessary for the quantity of mushrooms required, let the foundation upon which it is made be dry, or rendered so, let the dung be worked up in a sloping manner, so as to terminate with a narrow roof shaped ridge along the centre, about four or five feet high, beat it well down, as the process of building goes on. Beds made in the open sheds are constructed exactly in the same way.

When the bed has been made some time, and the heat sufficiently declined, the spawn may be put into it; but, for fear of the heat being too great in the upper part of it, the better plan is to spawn it at first only half way up all round.

Break the spawn into small pieces, and stick them into the sides of the bed, in rows about six inches piece from piece, when the bed is spawned as high as it is thought the heat of the bed will not injure it, take some good strong rich earth, the stronger the better, but of a loamy quality, and cover the spawned part of the bed with it, about two inches thick, beginning at the bottom of the bed. The earth should be in a pliable state, not too wet nor too dry. When the heat appears to have sufficiently declined, proceed to spawn and earth the top of the bed in the same manner, or if it be thought that the bed is not sufficiently fermented, spawn it a few days before, or even a week or more before the mould is put on it.

After all the fermentation has stopped, and on the approach of wet or cold weather, the beds should be covered sufficiently with clean straw, and over that bass or reed mats should be placed, the latter will have the effect of completely throwing off the rain. Care must be taken that after this covering is put on they do not heat a second time, which is very liable to take place, as the remaining heat and steam will be prevented from escaping; and were that circumstance to happen to any considerable extent, the spawn would run a great risk of being completely destroyed. This covering must be occasionally removed, at least so far as to admit of the beds being examined at least once a week, for the first few weeks after being covered. Little injury can be apprehended at any subsequent period from too much heat. Beds constructed in this manner sometimes lose their heat too soon, and when that is the case, the mushroom will be small, the beds unproductive, and sometimes the mushroom will not appear at all. On this effect being perceived, the covering should be entirely removed, and a coating of well fermented stable dung laid over them to the thickness of a foot or more, according to the season and the quality of the dung, this will throw a genial warmth into the bed, and will set the spawn in action. This being accomplished, the whole may be removed, and the beds covered up as before.

The length of time that elapses between making the beds and producing the mushrooms, depends upon a variety of circumstances, such as the state of the weather, the quality of the spawn and the like. Generally they begin to produce in a month or six weeks after being put up, and continue to produce for ten or twelve weeks, and often for a considerable time longer. The process of gathering the crop is, to uncover the beds carefully and cut the mushrooms up by the bottom, taking care not to displace or injure the young ones which are coming up close to them. As far as can be with safety accomplished, the old stump or root part should be removed, having a tendency when left in beds to procure decay, damp, and maggots. The large mushrooms are used for a variety of purposes, but the smaller or button ones are most esteemed in cookery.

Mushrooms may also be successfully cultivated in boxes, pots, or hampers, or indeed in any thing capable of keeping the materials together, and placed in any dry warm cellar, stable, or shed, where they can be defended from damp and frost. The practice of Mr W.

Wales, as given in the Memoirs of the Caledonian Horticultural Society, is as follows:—"The boxes or vessels are placed in the back sheds of the hot houses, or in any other house where no damp or frost can enter. There should be several boxes, a part only being filled at a time, so as to keep a rotation of crops, and to have mushrooms at all times ready for the table. Suppose three boxes to be filled at a time, each of which is three feet long, one and a half broad, and seven inches in depth; then let each box be half filled with horse dung 'droppings' from the stables, the fresher the better, and if wet to be dried for three or four days before it be put into the boxes: the dung to be well beaten down in the boxes. After the second or third day, if any heat has arisen in the dung, it is then a fit time to spawn; break each spawn into three parts, as equal in size as possible, then lay the pieces about four inches apart upon the surface of the dung in the box, on which they are to lay for six days, when it will probably be found that the side of the spawn next to the dung has begun to run into the dung below; then add an inch and a half more of fresh dung upon the top of the spawn in the box, and beat it down as before mentioned. In the course of a fortnight the box will be ready to receive the mould at the top; this mould must be two inches and a half deep, well beaten down with the back of a spade, and the surface made quite even. But before the box is earthed over, it will be proper to take up a little dung almost as far down as the bottom of the box, in order to ascertain if the spawn has run through the dung; if that has not taken place, let the box stand unearthed some days longer, for were it to be earthed over before the spawn had run through the dung, the crop would be very scanty. In the space of five or six weeks, the mushrooms will begin to come up; if then the mould seem dry, give a gentle watering, the water being slightly heated before its application. This watering will make the mushrooms start freely, and render them of a larger size. The boxes will continue to produce for six weeks, and sometimes for two months, if duly attended to, by giving a little water when dry, for they need neither light nor air.

Mr. Olcaker (*Hort. Trans.* vol. ii.) recommends the German mode of cultivating mushrooms upon shelves in houses constructed for the purpose. The shelves three feet and a half wide, are formed with slips of wood three inches wide and one and a half deep, nailed on an inch and a half apart, the front of the shelf being one inch thick and eight inches high.

Compost for the beds.—Collect a quantity of fresh horse dung that has neither been exposed to wet nor fermentation, clearing it of the long straw, so as to leave one fourth in quantity, of the shortest litter when incorporated with the horse droppings; then add a fourth part of tolerably dry turf mould, or other maiden earth, and mix it well with the dung before mentioned: the advantage derived from the mould or maiden earth, is the union of the whole into one *compact solid substance*, so congenial to the growth of mushrooms. If dung from the sides of a livery stable, or the round of a horse mill can be procured and mixed with a fourth part of short litter, and added to as many fresh horse droppings as will cause a gentle warmth, when made into beds, it will be found superior for the production of mushrooms, to horse dung that is gathered from the stables.

Method of making the beds—Lay a stratum of the prepared mixture on the shelves, about three inches thick; beat it, with a flat mallet, as close together as possible; then add another layer of compost, continuing the process as before, until the bed becomes seven inches high and very compact; provided that the thickness does not produce a fermentation equal to 80 or 90 degrees, another layer must be added and the surface made smooth; then make holes with a dibble three inches in diameter, and nine inches asunder, through the compost in every part of the beds; these holes will be a means of cooling the beds and preventing that excess of heat from taking place, which would produce rottenness, and render them unproductive. After heating and fermentation, the bed having become a mass of compact dung, and of a proper temperature, should be spawned while the heat is on the decline. If this operation be deferred until the heat is quite exhausted, the crop will be late and often unproductive.

When spawned about a week or a fortnight, cover with a coat of rich mould, mixed with a fourth or sixth part of droppings, about an inch and a half thick; beat down the bed completely, and finish it off for good. The heat of the shed or building should be kept at a temperature of about 55 degrees, Fahrenheit.

Mr. Housman describes a very simple process for obtaining mushrooms in-doors (*Gard. Mag.* vol. iv.) "Provide boxes three feet long, and one foot eight inches deep; a quantity of horse droppings perfectly dry, some spawn, and some light dry soil. Fill the boxes by layers of droppings, spawn, and soil, which must be trodden perfectly tight; repeat these tripple layers till the boxes are full, and all trodden firmly together. Four such boxes at work are sufficient for a moderate demand; and of a dozen, four brought on at a time, and placed on the flue of a pine stove, or any other forcing house, will produce a fair supply. The surface of these portable beds must be covered with a little hay, and occasionally, though sparingly watered. It is not absolutely necessary that they be set on the flue of a hot house; the kitchen cupboard, or any similar place, will suit equally well. This plan is also convenient in always affording a plentiful stock of superior spawn."

In the whole culture of the mushroom it is absolutely necessary, in order to ensure final success, to guard against over heats, and too much moisture; the effect of the beds becoming dry, only retards the production of a crop without lessening the chance of their appearing

in abundance when rendered sufficiently moist; and as it is always easier to apply water than to dry the beds, it is better to err on the safe side. The more compact the whole bed, together with the mould, can be made, the stronger will the spawn run, and the less liable will the beds be to become suddenly too moist or too dry. The greater the depth of material, the more juicy and productive the crop; and the more they are exposed to the action of air and light, the finer the flavour.—(*M'Intosh's Practical Gardener.*)

MUSTARD.

Mustard (*Sinápis*) Tetradynámia Siliquósa, Linn.; and Crucíferæ, Juss.

There are two species of mustard in cultivation.

1. The White Mustard, (*Sinapis Alba*).
2. The Black Mustard, (*Sinapis Nigra.*)

Culture, &c. of the White Mustard.

This species is extensively used as a small salad, and its cultivation is in every respect similar to that of the garden cress.—See *Cress.*

Culture, &c. of the Black Mustard.

This species is principally cultivated for its seed, in which case large fields are sown with it.

"Sow moderately thick, either in drills from six to twelve inches asunder, or broadcast, and rake or harrow in the seed. When the plants are two or three inches in the growth, hoe, or thin them moderately where too thick, and clear them from weeds. They soon run up in stalks, and in July or August return a crop of seed, ripe for gathering."

Abercrombie.

USE.

1. The seeds ground, constitute the well known condiment, flour of mustard. When moistened with rich milk, it makes the best appearance for the table, but it will not keep good for more than two days.

2. In some cases of dyspepsia, the seeds are swallowed entire, to the quantity of a table-spoonful or more, and frequently with great benefit. They stimulate the stomach, and excite the peristaltic action of the intestinal canal.

NASTURTIUM.

Nasturtium or Indian Cress (*Tropæ'olum*), Octándria Monogy'nia, Linn. and Tropæ'oleæ, Juss.

The nasturtium is a hardy annual, attaining in eligible situations the height of eight or ten feet. It flowers towards the end of June, and continues in blossom till destroyed by frosts. The blossoms in the evening emit spontaneously at certain intervals visible sparks like those produced by an electric machine. This phenomenon was first observed by the daughter of Linnæus. There are three varieties cultivated, but the *great* and double-flowered are preferred:—

1. The Great (*Tropæolum majus.*)
2. The Double-flowered (———— *var. flore pleno.*) This variety is propagated by cuttings, and requires to be treated as a green-house plant.
3. The Small or Dwarf (*Tropæolum minus.*)

Culture, &c.

SOIL.

The single varieties succeed best on a fresh light loamy soil, as the berries are less productive on either a very poor or a very rich soil.

PROPAGATED.

1. *By seeds*, sown in drills an inch and a half deep, and three or four feet asunder, the seeds being deposited two or three inches apart in the drills. Care should be taken to procure good sound seed of the last year's produce, as they seldom succeed if of a greater age.

2. *The season for sowing* may be any time from the beginning of March until the end of the first week in May, but not later.

3. *After-culture.*—When the plants are six inches above ground, they must be trained either to a trellis or fence, or they may be boughed after the manner of peas; the runners will require conducting in the first instance, when they will readily climb without farther assistance.

Use.

1. The young leaves and flowers are employed in salads.
2. The flowers are used for the garnishing of dishes, for which purpose the double-flowered variety is preferred.
3. The berries gathered green and pickled, form an excellent substitute for capers.

NEAT CATTLE.

Before civilization had pointed out to mankind the advantages of social intercourse, and when agriculture was but little known, or in its rudest state, pasturing appears to have been the general source from which mankind drew their sustenance. When the advantages of tillage became known, and riches exuberated from the soil, the value of pasturing was lessened, inasmuch as the herdsman's object was averted, and his attention divided between his crops and his cattle. In after ages, when agriculture was better known, and great improvements had been made by science, the grazier was zealously engaged in advancing the beauty, raising the value, and increasing the utility of his live stock. In this important part of agriculture, improvements are continually making, and will increase, so long as knowledge increases, and so long as industry prevails in the kingdom.

To facilitate our enquires upon this important and interesting subject, the following arrangement has been adopted :

1. The Description of the Varieties of Breeds.
2. The Properties of Neat Cattle.
3. Breeding and Rearing.
4. General Management.
5. Diseases.

1. *The Description of the Varieties of Breeds.*

To describe the whole of the breeds of Neat Cattle bred in England, would be a task not only difficult, but in a degree useless. There are, however, certain varieties, which are of importance to be described, while their sub-varieties are so numerous, and the differences existing between them so trivial, as to preclude the possibility of our giving very minutely the merits of all. We shall therefore give a general description of the breeds, which are comprised under the following heads :

1. Long-horned, or Lancashire breed.
2. The middle horned breed.
3. The Short-horned breed.
4. The Welsh breed.
5. The Polled or Galloway breed.
6. The Scotch breed.
7. The Alderney or French breed.
8. The Wild breed.

LONG HORNED, OR LANCASHIRE BREED.

According to Mr. Culley, this breed is distinguished from others by the length of their horns, the thickness and firm texture of their hides, the length and closeness of their hair, the large size of their hoofs, and their coarse, leathery, thick necks. They likewise are deeper made in their fore, and lighter in their hind quarters than other breeds, in general they are narrower in their shape, and less in point of weight, than many other breeds, viz : the short horns, Hereford, Sussex, and Devon, though better weighers in proportion to their size, and give considerably less milk, though it is said to afford more cream in proportion. They are more varied in colour than any of the other breeds, but whatever the colour be, they have in general a white streak along their back, which the breeders term finched back, and mostly a white spot on the inside of the hough.

The breed is to be found in the counties of Warwick, Leicester, Chester, and several others of the midland counties. In Leicester the breed is by far superior to those in the county from whence they derive their name, which is attributed to a Mr. Webster, of Cauley, near Coventry, who upwards of a century since introduced six cows from the banks of the Trent, and crossed them with bulls from Westmoreland and Lancashire. The late justly celebrated Mr. Bakewell, of Leicester, selected from this stock, and by close attention improved the long horned breed very materially. The Lancashire breed are under

stood by graziers to be in general rather slow-feeders, except that kind selected and recommended by the late Mr. Bakewell; these are said to eat less food than the others, to become remarkably fat upon the most valuable parts, but have little tallow in them when killed, and when used in the dairy, give very little milk. This variety also differs from the rest of the long-horned cattle in having very fine, clean, small bones, in their legs, and their hides not so thick, and more mellow under the skin.

THE MIDDLE-HORNED BREED.

The middle-horned breed comprehends in like manner several local varieties, of which the most noted are the Devon, the Sussex, and the Hereford; the two last according to Mr. Culley, being varieties of the first, though of greater size. These cattle are most esteemed of all our varieties for the draught, on account of their activity and hardiness; they do not milk so well as the short horns, but are not deficient in the valuable property of feeding at an early age, when not employed in labour.

1. *The Devon Breed.*

These are of a high red colour, if any white spots, the breed is considered impure; particularly if those spots run into one another; they have a light dun ring round the eye, and the muzzle of the same colour; fine in the bone, clean in the neck, horns of a medium length bent upwards; thin and fine in the chaps, wide in the hips, a tolerable barrel, but rather flat on the sides, tail small and set on very high; they are thin skinned, and silky in handling, feed at an early age, and arrive at maturity sooner than most other breeds; they are well fitted for draught, both as to hardiness and quick movement, and their shoulder points generally project outward, a great objection with many breeders of cattle. Parkinson states them to be a model for all persons who breed oxen for the draught. The South Devon are much heavier than the North, in consequence it is supposed of a cross from the Hereford, being in size but little inferior. The North Devon for fineness in the grain of the meat, are held in high estimation at Smithfield.

2. *Sussex Breed.*

John Ellman, Esq. to whom we are in a great measure indebted for the improvement of this breed, describes them as follows: "Nose tolerably wide, of a golden colour, thin between the nostril and the eye, the under jaw thin, eye rather prominent, and wide across the forehead, neck neither long nor short, but clean under with a small dewlap, the top part nearly straight to the head, (not what is commonly called ewe-necked,) top of the plate-bones not too wide and open, sides straight, no projection at the point of the shoulder, wide and open in the breast, which should project forward; forelegs straight, rather thin, and neither long or short; no hollowness on the back, behind the shoulder blades, which will be the case if the shoulder blades be very wide; the body as round as a barrel, chine-bone straight, the ribs broad, space between the first rib, and hip bones narrow, loin flat, and as wide at the fore-end as the hind, each side of the loin to lie high, and nearly parallel, i.e. as wide at the fore-end as the hind, which will be the case when the first rib springs well; hip-bones wide between, and broad, laying nearly or quite as high as the chine, the rump flat, long, and wide at the setting on of the tail, which should drop in between what is generally called the first touch, or tip of the rump; the outside of the thigh flat, and no fulness behind; the leg fine, which should be neither long or short; full within side the thigh, or what is called the twist. The feeding qualities are judged of from the hair being rather long and silky, and handling mellow under the skin; these generally feed well. The steers are taken into the team for work when three years old, (at which age the heifers generally produce their first calf) and are worked till six or seven years old, when they are turned off to fatten. Care should be taken that in their work they are kept in a good state of flesh, as, if the oxen are worked till they become very low in flesh, they seldom feed well afterwards: the best breeders of cattle seldom suffer them to be much reduced. The average weights of oxen, when fat for market, are from 130 to 150 stones of 8 lbs.; some, however, come to 180, or even 200 stones.

The difference between this breed and the North Devon, is not very striking; they are equally profitable to the grazier, and as working cattle they both stand unrivalled. The colour of both breeds is red, and they are supposed originally to be of the same breed. The Devon shew most good breeding, but are not so large as the Sussex cattle.

3. *The Herefordshire Breed.*

Colour either of a deep or light red, some few white, grizzle, or blue; white on the back and under the belly, with white face; horns very like the Sussex breed, coming out wide from the head, projecting forward, and turning up at the points or tips; of a tolerable length and rather thin; nose and eye nearly white; neck tolerably clean, coming well out between the shoulders; carcase straight and round; a thick chine: hips and rumps wide, and flat, the tail falling well in between the tips or points of the rumps, so as to be nearly hid when the beast is fat; the ribs broad and bowing, like a barrel; legs neither short nor long, of a middling size; wide and open in the breast; hair rather long and silky; handles mellow under the skin, which is rather thick than otherwise. The average weight of a four-year-old ox, when fat for market, is from 140 stones of 8lbs. to 160 stones. The steers are taken to work when three years old, but many are fattened, without being worked, at three and four years old.

On comparison with the Devon and Sussex, the Hereford breed will probably not be found less active and hardy in the yoke, but are generally considered to exceed them in the quality of fattening; and when compared with any other breed, may be ranked at least among the very best in the United Kingdom.

THE SHORT-HORNED BREED.

Culley, in describing this kind, states—" They differ from the other breeds in the shortness of their horns, and in being wider or thicker in their form or mould, consequently feed to the most weight, in affording by much the greater quantity of tallow when fattened, in having very thin hides, and much less hair upon them than any other breed, (Alderney excepted), but the most essential difference consists in the quantity of milk they give beyond any other breed. The great quantity of milk, thinness of their hides, and little hair, is probably the reason why they are more tender than the other kinds, Alderney excepted, weighing when fattened, at four or five years old, from 150 to 160 stones.

It is said of this kind, that they eat more food than any of the other breeds; nor shall we wonder at this, when we consider that they excel in those three valuable particulars, viz, in affording the greatest quantity of beef, tallow, and milk. Their colours are much varied, but the generality are red and white, mixed, or what the breeders call flecked; and when properly mixed, is a very pleasing and agreeable colour. This breed has been greatly improved by judicious crossing. Among the short-horned breeds may be noticed the Durham or Yorkshire breed.

This breed is chiefly to be met with in Lincolnshire, and the eastern parts of the counties of York, Durham, Northumberland, and Berwick. Amazing prices have been given for some of the varieties, and especially the Durham.

THE WELSH BREED.

Of this breed, there are several local varieties, but the best kind are chiefly bred in the counties of Caermarthen aud Pembroke, and fatted in the southern and midland English counties, where they are in considerable demand for grazing. Their colour is chiefly black, and they have fine horns, of a medium length, curving a little upwards, not unlike the Sussex or Devon cattle in form, but of a dark colour. They are of a middling size, short in the leg, but well proportioned and clean, though not small in the bone, with deep barrelled bodies. They are quick feeders, and produce excellent beef, and the cows are generally good milkers. The variety which is distinguished with a brown colour, is larger, and in every way inferior.

THE POLLED, OR GALLOWAY BREED.

Are a very valuable breed, and seem to be in weight and size as much less than the long horns, as those are than the short horns: they generally weigh from 50 to 60 stones,—some particular ones 70 (14 lbs. to a stone) and upwards; but the most essential difference from every other kind of cattle is, in having no horns, though some few, (in every other respect Polls) have two little unmeaning horns, from two to four inches long, hanging down loose from the same parts as the horns of other cattle grow, and are loosely joined to the head by a thin skin, and flesh. In most other respects these cattle resemble the long horns, both in colour and shape, only they are shorter in their form, which probably makes them weigh less. Their hides seem to be in a medium between the two last mentioned breeds; not so thick as the long horns, nor so thin as the short horns, but, like the best feeding kinds of long horns, they lay their fat upon the most valuable parts, and their beef is well marbled or mixed with fat.

Although we may find a few breeds interspersed about England, the greatest portion are bred in Scotland, and brought up in great numbers and sold in Norfolk and Suffolk at the fairs during the turnip feeding season; from whence in winter and spring they are sent to Smithfield market when fat, where they are generally sold at excellent prices. They are considered good milkers in proportion to their size, the milk yielding a rich quality. The oxen and spayed heifers answer very well for draught. In Galloway more heifers are spayed than in all the island besides, but they do not castrate their calves till they are about a year old, while in most other places, this operation is performed when they are from one to three months old.

Culley states their manner of rearing calves, which is still more singular. The calves from the time they are dropped till able to support themselves, are allowed to run with their dams, but are prevented from sucking by means of a small piece of leather with sharp spikes of iron fixed upon the outside, tied upon the upper part or the calf's nose, which, by pricking the cow every time the calf attempts to suck, prevents her from letting in until the milk maid comes, when she takes off the muzzle from the little animal's nose, and while she strips two of the speans, the calf takes care to empty the other two; as soon as the maid has done, she fixes on the instrument again, but it is done in such a manner as not to hinder the calf from feeding upon the grass, though it is not allowed to taste the milk until the girl returns to milking. In some parts of Scotland the general practice is to milk three times a day in summer; but I do not recollect whether this is done in Galloway."

The Suffolk duns although always of one colour, appear to have owed their origin to the Galloway. They are a very useful kind of little cattle for the dairy, and great numbers are used for this purpose in some parts of that county. The cows give great quantities of milk. Mr. Young says they give in common twenty-four quarts a day, which is nearly equal to the best short-horned cows.

THE SCOTCH BREED.

Of this breed there are several distinct varieties of which the principal are Kyloes, which Culley states are still less in proportion to the polled cattle than they are to the long horns: and like these their beef is fine grained, well flavoured, and mixed or marbled, but not so handsome on the outside of the beef when killed, being not of so bright a color, and often spotted with black even upon the best parts, except when made very fat. When grazed they feed very readily, their weight in general being from twenty to thirty-five stone (fourteen pounds), some particular ones reach to more than forty stone. The most prevalent colour is black, some are brindled or dun ; but the breeders here, like those in Galloway, prefer the black ones.

These hardy animals are in possession of all that extensive and mountainous Country called the Highlands of Scotland, (together with the western isles), bounded on all sides by the sea and the Grampian hills, the latter of which begin on the north side of the Frith of Clyde, and run eastward into the sea near Aberdeen. Beside this variety there are several others, including those of the Isle of Sky or Western Kyloes, and the Norlands, all of which partake in a measure of the Galloway kindness to fatten, and when pastured in the rich meadows of the south soon become fit for market.

ALDERNEY OR FRENCH BREED.

This breed affords the best milch cows, they are chiefly bred in the island from which they derive their name, and in the neighbouring islands, such as Guernsey and Jersey. "They are small sized; colour light red or dun, mottled with white; horns short and generally curled, or what some call crumple horn; bones fine. As fatting cattle they have but few good points, being thin and hollow in the neck, sharp and narrow on the back, light in the brisket, and lean on the chine, with short rumps and small thighs; but their flesh is fine grained, high coloured, and of excellent flavour. They are also very large in the belly; but this, as well as some of the points already mentioned, is rather an advantage to milch cows. Their udder is well formed."

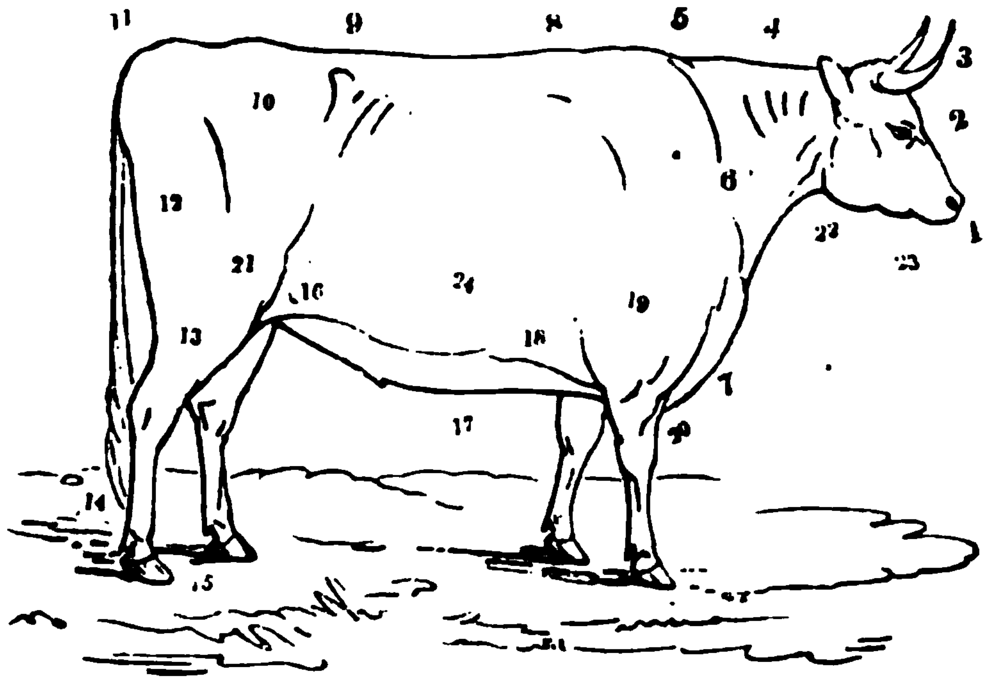
Their neatness of appearance and being exceedingly good milkers, has contributed to place them in the estimation of most dairymen, although their shape is defective. They are generally crossed in this country, which accounts for the breed being but rarely met with pure. It has been supposed by some that they will thrive on any poor pasturage with the assistance of hay in winter. They certainly, like all other light stock, do not require the same support as larger animals; still, when their milk is not equal to its general quality, it is owing to the pasturage not being so rich as in their native country; which probably is the cause of their being thought very tender, and requiring good nursing in winter.

THE WILD BREED.

This breed is noticed by Culley in the following manner:—"From being untameable can only be kept within walls or good fences; consequently very few of them are now to be met with except in the parks of some gentlemen, who keep them for ornament and as a curiosity. Their colour is invariably of a creamy white; muzzle black; the whole of the inside of the ear, and about one-third of the outside from the tip downward, red; horn white, with black tips very fine, and bent upwards; some of the bulls have a thin upright mane, about an inch and a half or two inches long. The weight of the oxen is from thirty-five to forty-five stone, and the cows twenty-five to thirty-five stone (fourteen pounds per stone). The beef is finely marbled and of excellent flavor. They afford much amusement in killing, and some years since were the only traces of ancient hunting. Their habits are more interesting to the naturalist than grazier, and therefore we shall decline further describing them.

2. *The Properties of Neat Cattle.*

In adverting to the properties of neat cattle, it will be advisable, in the first instance, to describe the points by which they are characterized.—



1. *The nose or muzzle*—In the Devon, Hereford, and Sussex, the muzzle is preferred when of a clear golden color. When brown or dark, it is an indication that this breed has been crossed with some of the Welsh or other breeds.
2. *The forehead* should neither be narrow nor very broad, the eye prominent. The nostril between the eye and muzzle should be thin, which is particularly the case in the best breeds of the Devon cattle.
3. *The horns* should be thin, projecting horizontally from the head, and turning up at the tips as in the breeds of the Devon, Sussex, and Hereford.
4. *The neck* should be neither long nor short, full at the sides, and not too deep in the throat, a thin dewlap.
5. *The top of the plate bones* should not be too wide, but rising upon a level with the chine, and well thrown back, so that there may be no hollowness behind; this point gives facility to the walk. From the point of the shoulder to the top of the plate bones should be rather full outside, to admit of the ribs to bow.
6. *The shoulder point* should lay flat with the ribs without any projection. When the shoulder point projects outward, the beast seldom fattens well about the shoulder vein.
7. *The breast* should be wide and open, projecting forward.
8. *The chine* should lie straight.
9. *The loin* should be flat and wide, each side laying parallel with the chine, nearly as wide at the fore part as the hinder part, which is an indication of the ribs bowing out, and which is desirable.
10. *The hip or huckle bones* should be wide apart, coming upon a level with the chine, to the first touch or setting on of the tail.
11. *The first touch or tip of the rump* should be tolerably wide, so that the tail drop in a level between the two points. The tail should come out broad as an indication of a flat chine.
12. *The thigh* should not be too full outside or behind, which is always an indication of bully flesh, but full the inside or twist.
13. *The hock or hough* should be flat and rather thin, not coarse and gummy, which indicates coarseness in the animal.
14. *The hind leg* should be flat and lean. The legs should be of a medium length, and the hock or hough rather turning out.
15. *The feet or claws* not too broad.
16. *The flank* should be full and heavy when the animal is fat, indicative of being fat inside
17. *The belly* should not drop below the breast, but in an horizontal line with it.
18. *The brisket.*
19. *The shoulder* should be rather flat, not projecting.
20. *The foreleg* should be also flat, and not fleshy and upright.
21. *The round or pot bone* should not project, but lie flat with the outside of the thigh.
22. *The under jaw.*—The jaws should be rather wide, particularly for beasts intended for working, as it affords them greater liberty to breathe.
23. *The chap* should be fine, indicating a dispostion to feed.
24. *The ribs* should spring nearly horizontally from the chine, and round in the sides, so as to form a circle, in which case the animal will never drop in the belly, and will lay on its meat on the back. The great objection to the Sussex breed of cattle is, that they are sharp in the chine, and the ribs lay too flat. When this is the case the animal will always drop in the belly, and seldom lay on its meat on the prime joints.

"The most desirable properties of live stock. (states Sir John Sinclair,) are size, form, a tendency to grow, early maturity, hardiness of constitution, prolific properties, quality of flesh, a disposition to fatten, and lightness of offal;" under which heads he has very clearly discussed the subject. We shall therefore avail ourselves of the important information, which we think will be interesting to our readers.

1. *Size.*—Before the improvements made by Bakewell, the value of an animal was entirely judged of by its bulk; and if a great size could be obtained, more regard was paid to the price the animal ultimately fetched, than to the cost of its food. Of late, since breeders began to calculate with more precision, small or moderate sized animals have been generally preferred, this must depend upon pastures, taste, mode of consumption, markets, &c. but as the intelligent breeder, however, unless his pastures are of a nature peculiarly forcing, will naturally prefer a moderate size in the stock he rears.

2. *Form.*—Though it is extremely desirable to bring the shape of cattle to as much perfection as possible, yet profit and utility ought not to be sacrificed to mere beauty, which may please the eye but will not fill the pocket, and which depending much upon caprice must be often changing.

In regard to form, the most experienced breeders seem to concur in the following particulars: that the form and shape should be compact, so that no part of the animal should be disproportioned to the other parts, and the whole distinguished by a general fulness and rotundity of shape. That the chest should be broad; for no animal whose chest is narrow can easily be made fat: that the carcase should be deep and straight; that the belly should be of a moderate size, for when it is more capacious than common in young animals, it shows a diseased state, and in older ones is considered a proof that the animal will not return in flesh, in milk, or in labour, the value of the extra quantity of food which it consumes; that the legs should be rather short, for the long-limbed individuals of the same family or race, are found to be the least hardy, and the most difficult to rear or to fatten; and that the head and the bones, and other parts of inferior value, should be as small as is consistent with strength, and with the other properties which the animal ought to possess. In animals bred for the shambles, the form must likewise be such as to contain the greatest possible proportion of the finer, compared with the coarser and less valuable parts of the animal. This, by selection, may be attained, and thus the wishes of the consumer may be gratified as to the broad loins and full hips, which are considered as a point of excellence in particular breeds. It is evident that the old narrow and thin make, require improvement, but the alteration may be carried to a faulty excess.

It was formerly the practice to estimate the value of animals by the size of their bones. A large bone was considered to be a great merit, and a fine-boned animal always implied great delicacy. It is now known that this doctrine was carried too far. The strength of an animal does not depend upon the bones, but on the muscles, and when the bones are disproportionably large, it indicates in Mr. Cline's opinion, an imperfection in the organs of nutrition. Bakewell strongly insisted on the advantage of small bones, and the celebrated John Hunter declared that small bones were generally attended with corpulence, in all the various subjects he had an opportunity of examining. A small bone, however, being heavier and more substantial, requires as much nourishment as a hollow one, with a larger circumference.

3. *A tendency to grow.*—Animals having this essential property *of growing* are usually straight in the back and belly; their shoulders well thrown back, and their belly rather light than otherwise. At the same time a gauntiness and paucity of intestines should be guarded against as a most material defect, indicating a very unthrifty animal. Being *too light of bone* as it is termed, is also a great fault. A good grower or hardy animal has always a middling sized bone. A bull distinguished for getting good growers is inestimable, but one whose progeny takes an unnatural or gigantic size ought to be avoided.

4. *Early maturity.*—Arriving soon at perfection, not only in point of *growth* or size but in respect of fatness, is a material object to the farmer, as his profit must in a great measure depend upon it. Where animals bred for the carcase merely, become fat at an early age, they not only return sooner the price of their food, with profit to the feeder, but in general also a greater value for their consumption than slow feeding animals. This desirable property greatly depends on a mild and docile disposition; and as this docility of temper is much owing to the manner in which the animal is brought up, attention to inure them early to be familiar cannot be too much recommended. A tame breed has also other advantages; it is not so apt to injure fences or break into adjacent fields, conseqently it is less liable to accidents, and can be reared, supported, and fattened at less expence. The property of early maturity in a populous country where the consumption of meat is great, is extremely beneficial to the public, as if it evidently tends to fatten at an early age, it is a sure proof that an animal will fatten speedily at a later period of his life. Very great improvements have been made by intelligent breeders, in the breeds of neat cattle and sheep, as a proof of which, we find the meat markets amply supplied to meet the increased consumption caused by the increase of population.

5. *Hardiness of constitution.*—In the wilder and bleaker parts of a country, the possession of a hardy and healthy constitution is a most desirable property in stock. Where the

surface is barren and the climate rigorous, it is essential that the stock bred and maintained there should be enabled to endure the severities and vicissitudes of the weather, as well as scarcity of food, hard work, or any other circumstance in its treatment, that might subject a more delicate breed to injury. In this respect different kinds of stock greatly vary, and it is a matter of much consequence to select for different situations, cattle with constitutions suitable to the place where they are to be kept. It is a popular belief that dark colours are indications of hardiness. In mountain breeds of cattle, a rough hide is reckoned a desirable property, more especially when they are to be kept out all winter. It enables them to face the storm instead of shrinking from it.

6. *Prolific quality.*—By this property is meant that the females of a breed both bear more frequently than usual, and also have frequently more than one at a birth. This property runs more strikingly in sub-varieties, or individual families, and though partly owing to something in the habits of animals, and partly to their previous good or bad treatment, yet in some degree seems to depend upon the seasons, some years being more distinguished for twins than others. In breeding not only the numbers but the sex of the offspring, seems to depend upon the female parent. Two cows produced fourteen females each, in fifteen years, *though the bull was changed every year*. It is singular that when they produced a bull calf it was in the same year. Under similar circumstances a great number of males have been produced by the same cow in succession, but not to the same extent.

7. *Quality of flesh.*—Breeds are likewise distinguished by the quality of the flesh. In some kinds it is coarse and hard, in others of a finer grain. In some breeds also, the flavour of the meat is superior;—the gravy they produce, instead of being white or insipid, is high coloured, well flavoured, and rich; and the fat is intermixed among the fibres of the muscles, giving the meat a streaked or marbled appearance. Breeds whose flesh have these properties are peculiarly valuable. Hence two animals of nearly the same degree of fatness and weight, and who could be fed at nearly the same expence to the husbandman, will sell at very different prices, merely from the known character of the meat.

8. *A disposition to fatten.*—This is a great object in animals destined for the shambles. Some animals possess this property during the whole progress of their lives; while in others it only takes place at a more advanced period, when they have attained their full growth, and are furnished at the same time with a suitable supply of food. There are in this respect other distinctions: most sorts of cattle and sheep which have been bred in hilly countries, will become fat on lowland pastures, and some animals lay on fat very quickly, when the proper food has been supplied; and some individuals have been found, even in the same breed, which have in a given time consumed the least proportional weight of the same kind of food, yet have become fat at the quickest rate. Even in the human race, with little food, some will grow immoderately corpulent. It is probably from internal conformation that this property of fattening is derived.

Here it may be proper to mention that indication of a tendency to fatten, which is technically called handling well. The graziers and butchers in various parts of the kingdom, had recourse to the hand, and the feeling of the skin or cellular membrane, for ascertaining a disposition to fatten; but since Bakewell directed the public attention so much to breeding, that practice has become more generally known. Handling cannot easily be defined, and can only be learnt by experience. The skin and flesh of cattle, when handled, should feel soft to the touch. A soft and mellow skin must be more pliable and more easily stretch d out, to receive any extraordinary quantity of fat and muscle, than a thick or tough one. The rigid skinned animal must therefore always be the most difficult to fatten. In a good sheep the skin is not only soft and mellow, but in some degree elastic. Neither cattle nor sheep can be accounted good, whatever their shapes may be, unless they are first-rate handlers.

9. *Lightness of Offal.*—It is also of much importance that an animal solely bred for the shambles should have as little offal, or parts of inferior value, as possible, consistently with the health of the animal, and consequently a greater proportion of meat applicable as food for man.

10. *The age* of neat cattle is shown by their mouths and horns. When turned two years old, the places of the calf's teeth are supplied by two central permanent incisor teeth: therefore a two-year old steer or heifer has the two central permanent incisors coming up, and the other six milk teeth remaining. At three years old the beast will have four permanent incisors, and four milk teeth; at four years old there will be six permanent incissors, and two shrunk and milk teeth, and very frequently pushed back and concealed behind the third incisors. These six teeth tolerably developed, and the two shadows of remaining milk teeth being thrust behind, probably misled Mr. Parkinson, a very respectable agricultural writer, to say that at four years old cattle were full mouthed. That is not the case until the expiration of the fifth year, when the eight permanent incisors are up: even then the corner teeth are small, and they do not attain their perfect size, and the beast is not properly full-mouthed until the end of the sixth year.

In the fourth and fifth years cattle are sometimes strangely annoyed by the diminutive milk teeth, which occupy the same socket with the others, and press upon the gums, and cause considerable inflammation. They are now not very firmly fixed, and may be

easily extracted. They are the wolves' teeth of the horse, which are the milk grinders, pushed out of their places, and although not expelled by the new molars, reduced by their pressure to a very little size, and yet sometimes exceedingly troublesome.

A beast of six years has all the incisor teeth fully grown. The edges of these teeth have, however, been gradually wearing down. Even at three years the edge of the central incisors is taken off. At four years a dark waving line, shewing the bone beneath, begins to appear. At five, this is seen in the four central ones; and at six it has extended over the whole set. At seven it is becoming broader and more irregular in them all, with a second, and broader and more circular mark appearing within the former one, and which, at eight, has extended over the six middle teeth.

At nine, the process of diminution which was observed in the milk teeth is beginning to appear in the permanent ones, and the two central teeth are evidently smaller than their neighbours; and the two dark marks in all except the corner teeth are rubbed into one, of a triangular shape. At ten, the four central incisors are diminished, and the mark is becoming smaller and fainter. At eleven, it is so with the six central ones; and at twelve, all are much diminished; but not to the extent to which the diminution of the milk teeth was carried, and therefore these teeth are much closer together than the milk teeth of the eighteen-month steer were. The mark is now very faint, or nearly obliterated, except in the corner teeth, and the inner edge is worn down to the gum. It is seldom that the animal is suffered to live beyond this period, because he is materially decreasing in value.

WEIGHT OF CATTLE.

As none but experienced judges can ascertain correctly the weight of cattle by sight, we may notice a method that has been adopted to a considerable extent of ascertaining the dead weight of cattle, by measurement while alive, which is found to be an expeditious mode, and if not to be implicitly depended upon, at least furnishes a very important assistance to the judgment of the dealer.

Rule.—Take the *girth* of the beast, by measuring round with a string or tape close behind the shoulder blade; and the by *length* measuring from the fore part of the shoulder blade, along the back to that bone of the tail which is in a perpendicular line with the hind part of the buttock. Multiply the girth, (in feet) by itself, and that product by the length, and then again by 42; the last product divided by 100 will give the weight in Smithfield stones of 8lbs. each. If stones of 14lbs. are required, the multiplier will be 24 instead of 42.

Tables have been published shewing by inspection the weight corresponding to any given girth and length. Those we have seen however are adapted to the heavy stone, whereas that of 8lbs. is used both at Smithfield and in Sussex. A table adapted to the latter, is exhibited in the following page, and also forms part of the collection annexed to Baxter's "Farmer's Account Book."

To use the Table.—With the length found as above enter the Table, at the left hand side, and move the finger towards the right, till you come to the column which has the feet and inches of girth marked at the top; at the point where the finger rests will be found the weight of the animal in stones and quarters, reckoning eight pounds to the stone.

Example.—Suppose the length of a beast to be 3 feet 11 inches, and the girth 5 feet 2 inches; by referring to the Table it will be seen that his weight is 43 stones and 3 quarters.

Note.—In case of an ox only half fattened, there must be deducted one stone in twenty from the weight given by the Table.

The same assistance is furnished to the grazier and dealer in a different form, viz—that of a little instrument called "Cary's Cattle Gauge;" which is a sliding rule, eight inches long, and extremely simple and expeditious in use. It contains a scale of lengths, and another of girths, both in feet and inches, a scale of weight in stones, and two index marks, for stones of 8lbs. and 14 lbs. respectively. Then, to use the instrument, place the proper *mark* to the given length on the lower scale, and against the given girth on the slide will be found the required weight on the upper scale.

The same thing may be done, though not quite so readily, by the common carpenter's rule, thus:

C	Length in inches.	Weight in stones of 8lbs.
D	64	Girth in inches.

That is—set the length, on C, to the constant number 64, on D, and against the girth on D, will be found the weight. If the answer be required in stones of 14lbs. use the constant number 85.

A TABLE

FOR ESTIMATING THE WEIGHT OF CATTLE, SHEEP, AND SWINE, BY MEANS OF THE GIRTH AND LENGTH, TAKEN IN FEET AND INCHES.

GIRTH.

Length	3ft. 0	3f. 2i.	3f. 4i.	3f. 6i.	3f. 8i.	3f. 10	4f. 0i.	4f. 2i.	4f. 3i.	4f. 4i.	4f. 5i.	4f. 6i.	4f. 7i.	4f. 8i.	4f. 9i.	4f. 10
in.	st. q	st. q.	st. q.	st. q.	st. d.											
0	7,2	8,1	9,0	10,1	11,1	st. q.										
2	8,0	9 0	10,0	11,0	12,0	13,0	st. q									
4	8,3	9,2	10,3	12,3	13,0	14,1	15,3	st. q	st. q.	st. q.						
6	9,2	10,1	11,2	12 3	14,0	15,1	16,3	18,0	18,3	19,2	st. q	st. q.	st. q.			
8	10,0	11,0	12,1	13,3	14,3	16,1	17,3	19,1	20,0	20,3	21,3	22,2	23,2	st. q.	st. q	st. q.
10	10,3	11,3	13,0	14,2	15,3	17,1	19,0	20,2	21,1	22,1	23,1	24,0	24,3	25,3	26,3	27,2
0	11,1	12,2	13,3	15,2	16,3	18,1	20,0	21,3	22,3	23,2	24,2	25,3	26,2	27,1	28,1	29,1
2	....	....	14,3	16,0	17,3	19,2	21,1	23,0	23,3	24,3	26,0	26,3	27,3	28,3	30,0	30,3
4	....	....	....	17,0	18,3	20,2	22,1	24,1	25,1	26,0	27,0	28,1	29,1	30,1	31,2	32,2
6	....	....	....	....	19,2	21,2	23,2	25,1	26,2	27,2	28,0	29,2	30,3	31,3	33,0	34,0
8	....	....	....	....	....	....	24,2	26,2	27,3	28,3	30,2	30,0	32,1	33,1	34,3	35,3
10	....	....	....	....	....	....	....	27,3	29,0	30,0	31,1	32,2	33,3	34,3	36,	37,2
0	....	....	....	....	....	....	....	....	....	....	32,3	34,0	35,1	36,2	37,3	39,1

Length	4 11	5 0	5 1	5 2	5 3	5 4	5 5	5 6	5 7	5 8	5 9	5 10	5 11	6 0	6 1	6 2
in.	st q	st. q	st q.													
4	33,3	35,0	36,1	st. q	st. q											
5	34,3	35,3	37,0	38,1	39 2	st q.										
6	35,2	36,3	38,	39,	40 2	41,3	st. q.									
7	36,2	37,2	38,3	40,	41,1	42,3	44,0	st. q	st. q.							
8	37,1	38,1	39,3	40,3	42,1	4 82	45,0	46,1	47,3	st. q.						
9	38,1	39,1	40,3	41,3	43,1	44,2	46,0	47,2	48,3	50,2	st. q.					
10	[illegible]	40,0	41,3	42,3	44,1	45,2	47,0	48,2	50,0	51,2	52,1	st. q.				
11	39,3	41,0	42,2	43,3	45,1	46,2	48,0	49,3	51,0	52,2	53,2	55,3	st. q	st. q		
0	40,2	42,0	43,2	44,3	46,1	47,2	49,0	50,3	52,1	53,3	55,2	57,1	58,3	60,2	st. q.	
1	41,2	42,3	44,1	45,3	47,1	48,2	50,0	51,3	53,1	54,3	56,1	58,0	59,3	61,3	63,3	st. q
2	42,1	43,2	45,1	46,3	48,0	49 2	51,0	52,3	54,2	55,3	57,3	59,1	61,0	63,0	65,0	66,2
3	43,1	44,0	46,1	47,2	49,0	50,2	52,0	53,3	55,2	57,0	59,2	61,0	62,2	64,1	66,0	67,3
4	44,0	45,	47,0	48,2	50,0	51,2	53,0	54,3	56,2	58,0	60,1	62,0	63,3	65,2	67,1	69,0
5	44,3	46,1	48,0	49,2	51,0	52,2	54,0	56,0	57,3	59,1	61,1	63,0	64,3	66,3	68,1	70,1
6	45,2	47,1	48,3	50,2	52,0	53,2	55,0	57,0	58,3	60,1	62,2	64,1	66,0	68,0	69,3	71,2
7	46,1	48,0	49,3	51,1	53,0	54,2	56,0	58,0	59,3	61,2	63,2	65,1	67,1	68,3	71,0	72,3
8	47,1	48,3	50,2	52,1	54,0	55,2	57,0	59,0	61,0	62,3	64,2	66,2	68,2	70,1	72,1	74,0
9	48,0	49,3	51,2	53,1	54,3	56,2	58,0	50,1	62,0	63,3	65,3	67,3	69,3	71,3	73,3	75,2
10	49,0	50,2	52,1	54,0	55,3	57,2	59,0	61,1	63,1	65,0	67,0	68,3	71,1	73,0	75,0	76,3
11	....	51,2	53,1	55,0	56,3	58,2	60,1	62,2	64,1	66,0	68,1	70,0	72,0	73,3	76,1	78,0
0	....	....	54,1	56,0	57,3	59,2	61,1	63,2	65,1	67,1	69,1	71,1	73,1	75,2	77,3	79,2
1	....	....	....	....	58,3	60,2	62,1	64,2	66,2	68,1	60,2	72,2	74,2	76,3	79,0	80,3
2	....	....	....	....	....	61,2	63,1	65,2	67,2	69 1	71,2	73,2	75,3	77,3	80,1	82,0
3	....	....	....	....	....	....	64,2	66,2	68,2	70,2	72,2	75,0	77,0	79,1	81,2	83,2
4	....	....	....	....	....	....	....	....	69,3	71,2	73,3	76,0	78,1	80,1	82,3	84,3
5	....	....	....	....	....	....	....	....	....	72,3	75,0	77,1	79,2	81,3	84,0	86,0
6	....	....	....	....	....	....	....	....	....	....	76,0	78,2	81,3	83,0	85,1	87,2
7	....	....	....	....	....	....	....	....	....	....	....	79,2	82,0	84,0	86,2	88,3

Length	6 3	6 4	6 5	6 6	6 7	6 8	6 9	6 10	7 0	7 2	7 4	7 6	7 8	7 10	8 0	8 2
in.	st. q	st. q	st. q													
6	73,3	75 2	77,2	st. q.	st. q											
8	76,1	78,1	80,1	82,2	84,3	st. q.	st. q.									
10	79,	80,3	83,1	85,2	87,3	89,3	92,2	st q.								
0	82,0	84,0	86,0	88,2	90,3	93,0	95,2	97,3	st. q							
2	84,1	86 2	88,3	91,0	[illegible]	96,0	98,3	101,0	106,8	st. q	st. q					
4	87,1	89,2	91,3	91,0	96,3	99,0	101,3	104,0	109,2	114,0	120,1	st. q.				
6	90,0	92,2	94,3	97,0	100,0	102,1	105,0	107,2	112,0	118,0	124,0	129,3	st. q.	st. q		
8	92,2	95,0	98,1	99,3	105,0	105,1	108,1	110,2	116,1	121,3	127,2	133,3	139,3	145,2	st. q.	
10	95,1	97,3	100,1	02,3	106,0	108,1	111,1	114,1	119,3	125,1	131,2	137,2	143,3	150,0	156,3	st. q.
0	....	....	103,0	105,3	109,0	111,2	114,2	117,2	123,1	129,0	135,1	141,2	147,2	154,1	161,1	167,3
2	....	....	....	108,2	112,0	114,2	117,3	120,2	126,3	132,2	139,0	145,2	151,2	158,2	165,3	172,1
4	....	....	....	....	115,0	117,3	121,0	123,3	130,1	136,1	142 2	149,1	155,3	163,0	170,0	177,0
6	....	....	....	....	....	....	124,0	127,0	133,3	139,3	146,2	153,1	159,3	167,1	174,3	181,3
8	....	....	....	....	....	....	....	....	137,0	143,1	150,1	157,1	163,3	171,2	179,1	186,2
10	....	....	....	....	....	....	....	....	....	146,3	154,0	161,1	168,0	175,3	183,2	[illegible]
0	....	....	....	....	....	....	....	....	....	....	157,3	165,1	172,0	180,1	188,0	195,3
2	....	....	....	....	....	....	....	....	....	....	....	169,1	176,1	184,3	192,1	200,1

3. *Breeding and Rearing.*

This important branch of farming may be advantageously conducted on most farms possessing moderate pastures, particularly if aided by green crops in proportion: though on very small farms the land which must necessarily be appropriated to that purpose, may in general be more profitably employed.

To ensure success great caution and judgment must be exercised in the careful selection of the males and females, having particular regard to their constitutional qualities, or it will be vain attempting to produce good stock (we do not mean large animals), but would recommend to all breeders, either of sheep or neat cattle, to consult the quality of their pastures before they aim at breeding large animals, as large beast and sheep will not be profitable if kept on land of disproportional quality; rather obtain a smaller breed of beast or sheep as will improve on lands of an inferior description than those on which they are intended to be fed, as a small animal will do well and improve on lands where the larger ones will go back daily and almost starve. In coupling the male and female, great caution must be used that the male be as perfect as possible, but more particularly so on such points in which the female is defective, or the produce will be more defective than its dam.

The best manner of preventing any particular stock from retrograding is a disputed point, but which has been ably discussed by Sir John Sinclair, to whom we are indebted for the following remarks.

1. *Breeding from the same family.*—This method is called breeding *in and in*, or putting animals of the nearest relationship together. Though this plan was for some time in fashion, under the sanction of Bakewell's authority, yet experience has now proved that it cannot be successfully persevered in. It may, however, be beneficial if not carried too far, in fixing any variety that may be thought valuable; but on the whole, under this system, the young animal comes into the world on comparatively a very small scale, though by keeping it fat from the first moment of its existence it is made to attain a greater size than nature intended, and its weight in consequence will be very great in proportion to the size of its bones. Thus a generation or two of animals of an extraordinary form, and saleable at enormous prices, may be obtained; but that does not prove that the practice is eligible if long persisted in. On the contrary, if the system be followed up, the stock gets tender and delicate, and though they may retain their shape and beauty, they will decrease in size and activity, will become lean and dwarfish, and ultimately be unable to continue the race. The instances of this are numerous. The celebrated breeder, Prinsep, found the decrease of size unavoidable, and in spite of all his endeavours, by keeping his young stock well, to prevent it. This, among many other instances which we could mention were it it necessary, proves how unprofitable such connections are. That is no reason, however, why a breeder may not manage a particular family of animals to great advantage by shifting or changing, instead of breeding directly from parents to offspring. Hence the propriety of procuring males from the stocks and herds of those who have the same or similar breed. It has been remarked that those farmers have in general the worst flocks who breed from rams produced on their own farms, and that an interchange of males is mutually beneficial. In many cases this will be ineffectual unless the rams are equally good.

With respect to the doctrine, "that when you can no longer find better males than your own, then by all means breed from them, for that best can only beget best." It is ably refuted by an intelligent author, who has devoted much attention to the art of breeding. He observes that there never did exist an animal without some defect in constitution or form, or in some other essential quality; and such defect, however small it may be at first, will increase in every succeeding generation, and at last predominate in such a degree as to render the breed of little value. Breeding *in and in* would therefore only tend to increase and to perpetuate that defect, which might be eradicated by a judicious selection from a different family in the same race, where great attention has been paid.

2. The breeding from different families of the same race is therefore a preferable system. When these have been for some time established in different situations, and have had some slight shades of difference impressed upon them by the influence of different climates, soils, and treatment, it is found advantageous to interchange the males for the purpose of strengthening the excellences and remedying the defects of each family. This practice is followed by the most skilful breeders at present.

3. Any attempt at improvement by crossing two distinct breeds or races, one of which possesses the properties which it is wished to obtain, or is free from the defects which it is desirable to remove, requires a degree of judgment and perseverance to render such a plan successful, as is very rarely to be met with. Indeed, though such crosses may by great attention answer at first, yet it is generally found that singularities attend such mixtures; and in breeding bulls, though some of them may apparently do well, yet their breed is not to be trusted. The first cross between a good short-horned bull and a good Kyloe cow, will make a good grazing animal; but by proceeding farther disappointment will ensue, if a regular stock be wanted. If such a cross is to be persevered in, the male should always be of the same breed with the first.

Crossing with larger males from another country is sometimes attempted with a view of enlarging the size of the stock, but such attempts should be made with the greatest caution; for, by a mistaken practice extensively pursued, irreparable mischief may be effected. Where a particular race of animals has continued for centuries it may be presumed that their constitution and size is adapted to the soil and climate. Any attempt to increase the size of a native race of animals, without improving their food, by which their size is regulated, is a fruitless effort to counteract the laws of nature. In proportion to their increase of size by crossing, they become worse in form, less hardy, and more liable to disease. The only satisfactory and judicious mode of enlarging the size of any race of animals is, by maintaining better the original stock of the country, more especially during their youth. In every case where the enlargement of the carcass is the object, the cross breed must be better fed than the native parent. Hence if a good stock can be otherwise obtained, crossing ought to be avoided, for it produces a species of mongrel; and it is more difficult to get rid of the imperfections thus introduced into a breed, than is commonly imagined.

It is the opinion of Henry Cline, Esq. that any improvement of form by crossing, must entirely depend on selecting a well-formed female, larger in size than the usual proportion between females and males. The fœtus will thus be better nourished, which is so essential to the production of an animal with the most perfect form. Abundant nourishment is necessary from the earliest period of its existence until its growth is complete.

Mr. Boswell, in an Essay which gained the prize of the Highland Society, in 1825, has with great sense argued on the comparative influence the male and female have in impressing the offspring; which this gentleman attributes to the male. After advancing the grounds of his position, and strengthening his argument in the instances of the improvement which certain districts have received the benefit of by the introduction of some celebrated stallion, he states :—

" I would next look a little at the influence the male has in the ox. Here, although I still see the male has by far the greatest influence, I would say there was a shade of difference, perhaps five per cent., less than in the horse. The cow appears to be an animal whose progeny is often much affected by her imagination during the time of conception, or rather during the period when she is in season. From my own experience, as well as the information of trustworthy men has taught me, I am inclined to think that the calf very often takes after the beast that has been jumping on the cow (whether ox or cow), previous to her being taken to the male. One of the most intelligent breeders I ever met with in Scotland, Mr. Mustard, an extensive farmer on Sir James Carnegie's estate in Angus, told me a singular fact with regard to what I have now stated. One of his cows chanced to come into season while pasturing on a field which was bounded by that of one of his neighbours; out of which field an ox jumped, and went with the cow until she was brought home to the bull. The ox was white with black spots, and horned. Mr. Mustard had not a horned beast in his possession, nor one with any white on it; nevertheless, the produce on the following spring was a black and white calf with horns. I have twice had pure Ayrshire cows, which are uniformly what is called red and white, with horns. The first of those I put to a brown bull without horns; the first produce was very dark red without any white and polled. The next cow was put to a jet black bull with horns; the first produce was dark red without any white, and the next was jet black, and also without any white; and in both cases the make of the progeny took greatly after the sire. On settling in the north of Scotland as a farmer, I soon perceived that one of the greatest defects in the cattle was a tendency to be knock-kneed behind, and in my endeavours to get rid of this, I procured a bull from the south of Scotland, free from that defect, and with him crossed the best looking cows of the country. I instantly got rid of that narrowness behind, observable in all cattle where no attention has been paid to the breed; and in a few years, by drafting such queys or cow calves as did not please me, and breeding only from good shaped ones, I made a breed for myself, which I had done before I knew it; for having one season lost almost all my own calves, I was in consesequence of this misfortune forced to buy in calves. These were treated in the same way as to food, &c. as my own, yet those of my own cows soon shot far a head of them, both in size and condition; and on examination of the two sets of animals, an evident superiority of form existed in those of my own, especially in the smallness aud beauty of the head, with a prominent eye; and a fact not hitherto mentioned, that of the tail being one half less as to the thickness than in the unimproved breed, while the wide chest (that unerring sign of a good and quick feeder), was very conspicuous. It would seem that horns had been given to the cow by nature, and that the polled breed have been procured by selection of some of those varieties we so often see, as I observe that it more frequently occurs when a polled bull is put to a horned cow, that the produce resembles the mother in that particular, that when a horned bull is put to a polled cow, when horns are always the consequence. A great many years ago, the father of the present Sir Alexander Ramsey, of Fasque, brought a few of the Lancashire cattle to Scotland, a breed there much in fashion, and, as every one knows, remarkable for having uncommonly wide spreading horns, and all with some white, especially on the back. These cattle were intermixed with the cows of the country; and when Sir Alexander came to his estate, the cattle were all horned. About that time the polled or clodded cattle came greatly in vogue in Angus,

and Sir Alexander purchased from time to time, jet black polled bulls, so that in a short time all his cows were of this sort. Nevertheless, every year, even to this day, one or two of the calves, "cry back to the Lancashire," having white, and horns; and what is singular, it is almost invariably in the male that this takes place. This is always the case when two distinct breeds are put together, one with horns and the other without, and by saving their produce as breeders without horns, they will in time come nearly all polled, and by crossing again with a polled bull for eight or ten years, sometimes a calf will drop exactly like the original animal we wished to be rid of, and it requires more than the life of man to get rid of it entirely; this is one great objection to crossing two distinct breeds.

It will be next advisable, in continuation of the subject, Rearing and Breeding, briefly to allude to those particulars connected with the Bull, the Cow, the Calf, and the Ox, which, in the general principles already laid down on this important branch, have not been mentioned, and which will be included under the following heads:

BULL.

The object of the breeder must always govern the description of bull required, but to arrive at excellence, there is one form essential to all, and which is described by Culley, as follows:—The head of the bull should be rather long, and muzzle fine; his eyes lively and prominent, his ears long and thin, his horns white, his neck rising with a gentle curve from the shoulders, and small and fine where it joins the head; his shoulders moderately broad at the top, joining full to his chine and chest, backwards, and to the neck vein backwards; his bosom open, breast broad and projecting well before his legs; his arms or fore-thighs muscular and tapering to the knee; his legs straight, clean, and very fine bone; his chine and chest so full as to leave no hollows behind the shoulders; the plates strong to keep his belly from sinking below the level of his breast; his back, or loin, broad, straight, and flat; his ribs rising one above another in such a manner that the last rib shall be rather the highest, leaving a small space to the hips or huckles, the whole forming a round or barrel-like carcase; his hips should be wide placed, rounder, globular, and a little higher than the back; the quarters, from the hip to the rump, long, and instead of being square, as recommended by some, they should taper gradually from the hips backwards, and the turls or pot bones not in the least protuberant; rumps close to the tail; the tail broad, well haired, and set on so high as to be in the same horizontal line with his back.

A bull is in possession of his generative powers, and is competent to be used with two-year-old heifers at fifteen months; but it is not advisable to permit him to cohabit with large cows, until he is arrived at greater strength. It is proved by practice that the produce of a bull of fifteen months is equally stout and healthy as that produced from a bull of a greater age. To a young bull we would not advise more than ten or twelve heifers; but the numbers increased till he is four years old, at which age the bull may be considered in possession of his greatest powers. The cow and ox attain their full age at seven years. Bulls, when let loose with cows are very much in the habit of not confining themselves to those allotted to their charge, but roam away and visit others; to prevent this they are by some breeders tied up in a pen or stall, and fed during the summer on cut grass, clover, or any other green food, and in winter on hay. When required they are let out to the cows. Others let them run with the cows throughout the year, and some work them with the oxen, but the latter is by no means recommended, as the bulls are generally vicious with oxen, and generally do mischief by goring them. The working of a well-trained bull, however, may be found advantageous on a small farm, where his labour is of consideration.

COW.

The cows which produce large quantities of milk, do not generally keep themselves in the same condition as others that produce but little. But this is not, as some suppose, a proof that the one does not fatten equally as fast as the other when dry. When both are in milk, the food which is eaten by the cow that gives the greatest quantity, is converted in a great degree to the production of milk, while the food of the other is appropriated to the laying on of flesh.

While agriculturists have devoted their attention to improving the symmetry of their stocks, the form of milch cows seem to have been altogether neglected. Those who breed for dairy purposes, are usually, neglectful of the shape or inclination to feed, and breed from the best milkers, although there is no possible reason why both might not be united.

When heifers are permitted to run with the bull, they often conceive at the age of twelve or fifteen months; but it is by no means advisable, as it frequently injures the growth

of the heifers, and are often lost in producing the calf, when so young. It is not desirable to let them produce a calf, till they are three years old. In dairy counties they prefer the heifers which produce calves at two years old, under the impression that they make better milkers.

The term of gestation is nine months; sometimes it may be a few days before or after. The time of taking the bull should be about May, that the calves may drop about February. The date should be remembered by the breeder, that he may have no difficulty in affixing the period of delivery, and taking the necessary precautions; generally the cow conceives after once taking the bull, but should she fail, she should be taken to the bull again as soon as the symptoms return. She should be kept separate from the other cows during that day and night, that she may not be disturbed, as cows will frequently afterwards ride one another, and are liable to sustain injury. Although artificial means have been used to bring a cow into season, it is much to be reprobated, since nature's laws, cannot, without injury, be altered; and by such subversion, the result is not profitable. The time may always be known by her restlessness, by her riding on other cattle, and by the inflamed appearance of the external parts, accompanied by a discharge from the vagina. These symptoms seldom remain more than a day and night, sometimes not so long, and do not return till about three weeks; and when conception has taken place they disappear. After three or four months, cows may be ascertained to be in calf by pressing the hand on the off-flank, as when that is the case, the calf is found to strike against it. They are also known to be near calving by their springing at the udder and bearing, the former becoming more fully distended with fluid, while the latter is larger and more swelled. In heifers or young cows with the first calf, the udder will extend two or three months previous to calving, while older cows seldom spring the milk more than three weeks or a month previous to calving.

Cows are very subject to abortion during gestation, to avoid which they should be prevented from exertion in leaping, or other dangerous exercise, or being turned with any strange cows. In winter, when kept in the yards or closes, and fed in cribs, care should be taken that the cribs are kept nearly full of litter, or the bottoms raised so as to prevent the cattle injuring themselves by straining in reaching after their food. Abortion is frequently produced in a wet season by the heifers and cows being kept out late in the autumn on grass, without dry food such as hay or straw, being given to counteract the too great proportion of fluid taken up by the animal in grazing, which has been found by experience to be very injurious, and has often when it has not produced abortion caused the calf to be dropsical.

When the cow is about half gone with calf it should not be fed on grains, turnips, or other succulent food, unless accompanied with some dry fodder, as hay, straw, &c; neither should it be turned out to grass when the season is far advanced or the pasture very moist. During the whole of the parturient state it will be advisable not to keep the animal in too high a condition on account of their greater liability to inflammation after calving.

With respect to the proper time for drying off the cow previous to the period of calving, we should advise an interval of three months at least, for so long as there is a drain from the cow, she is necessarily kept in low condition, and especially as she draws near the time of parturition, for she then has to supply the calf within her with nourishment, as well as her keeper with milk. But it is the practice with milkmen not to let the cow dry until within a week or fortnight of the time of calving; but then the cows are well fed. We should certainly not recommend this practice, as it must be injurious to the dam and the young.

"The symptoms of calving are a distension or springing of the udder, and gradual yielding of the ligaments of the couples or rump bones, which are generally perceptible about a fortnight before the cow is at her full time; when that arrives, it is marked first by a slight elevation of the tail, and then by general uneasiness until the pains commence."

If the cow should be so much exhausted in calving, that the throes are not sufficient to produce the birth, she should occasionally have a drink of two or three quarts of gruel and a pint of ale, which will give her strength to make further efforts to get rid of the calf, and will also assist the operation. Cows generally calve in a recumbent posture, and care should be taken that the place where they lie down is not on a steep descent, for in that case, the calf is apt to be brought prematurely forward, and by the straining and irritation, it produces a tedious, and sometimes dangerous calving.

During the day and night after calving, the cow should be kept in-doors and supplied with luke-warm water for drink, or a bran mash;—but if the cow is very weak, a malt mash should be given, which will prove nourishing, and may be repeated the following day if necessary. She should not be turned out for a few nights after calving, but should be kept in the stall and from cold water, as the application of cold has a tendency to produce inflammation.

Should the fœtus be in an unnatural position the cow must be assisted, but by no means should any force be used, only at that period when the pains are on. In cases of cows slipping their calves, the greatest attention is required and the utmost cleanliness

observed; it is sometimes caused by ill treatment, turning strange cows with them, but more frequently from grazing in autumn on wet land, without having hay to counteract the effects of the fluid taken up by the animal. As cows are very subject to abortion when feeding on succulent plants, such as mangold wurzel, turnips, &c. or even wet grass, they should be occasionally bled, which is considered to act upon them as a preventive. Should a cow slink her calf within three or four months of the time of calving, she should, if in milk, by all means be kept on milking, and when the regular time of calving is arrived, the milk will flow nearly in as great a quantity as if a natural birth had taken place. The cows which have been affected with abortion, should be permitted to be in the company of breeding cows as little as possible, neither should barren cows, as both will disturb the quietude of the others, and probably cause abortion in some of them. It is a singular fact respecting the slinking of calves, that cows never thrive well where they are in the habit of inhaling the effluvia arising from dunghills, or the refuse of slaughter-houses, which, of course, should be removed, and especially the latter, as many instances have come to our knowledge, of abortion occurring year after year, in the same situation, in consequence of the cause not being suspected in the first instance.

To assist the after birth, as it is termed, it is recommended to give the cow the following drink:—"Let about three quarts of milk simmer over the fire, and when warm, strew in as much oatmeal as will be sufficient to make a strong gruel, carefully stirring the whole till it boils, that no lumps may arise, then add one quart of ale (or two of table beer), and one pound of treacle, and carefully incorporate the different ingredients by stirring. This mixture should be given lukewarm. It is peculiarly grateful to cows, which they will drink eagerly after the first hornful, and is considered useful as regulating the state of the body. This latter object, however, may be effected by giving a warm bran mash; but this treatment only applies to animals that are housed.

It not unfrequently happens that the milk flows into the udders of cows in so great proportions before calving, as to render it peremptory that part of it should be drawn off to prevent inflammation of the udder; this should be carefully done by taking only as small a quantity as may be necessary to lessen the distension, and give the desired relief once a day, the necessity of adopting that course being generally shown by the continual dropping of the milk. Immediately after calving, the calf should be allowed to suck as long as he is willing, or until the udder is relieved from the impurities excited by the undue course of nature; but should any lumps or cores remain, it will then be necessary to have the udder well drained night and morning, and frictions by the hand (previously anointed with elder-flower ointment) perseveringly applied two or three times a day; by these means suppuration of the udder and the destruction of the speens, will be prevented, which is always a serious injury, completely obviated. If a prolapsus reteri has once occured the cow should never be allowed to take the bull again; but in ordinary cases she may be put to bull in four or five weeks from the time of calving.

THE CALF.

The calf when first dropped is generally cleansed by the tongue of its dam from the slimy matter which always adheres to the skin of the animal. Sometimes it happens that the cow will not at first recognize her offspring, but upon a small quantity of salt being strewn over it, to which all neat cattle are particularly partial, she commences the motherly duties by licking the skin. The first milk or beastings appears to be calculated to nourish the calf, which should be allowed to suck plentifully before the cow is milked. It is the practice with some, as soon as the calf has sucked as much as it pleases, to milk the remainder so as to cleanly drain the udder, and give it to the cow as nourishment.

The treatment of calves in rearing varies very materially in different counties, and even in districts. In Sussex the calf is by many not allowed to take all the milk of the cow, but is shut up from her in the morning and evening, and a small quantity of bran or ground oats given in a trough, and not suffered to suck till the maid comes to milking, when she milks two teats while the calf sucks the other two; after which, when the girl has got all the milk she can, the calf is left with the cow a short time, to draw the udder as clean as possible, and if there be any carrols occasioned by the pores being stopped, through which the milk flows to the speens or teats, the calf beating or striking with his nose, will break them better than by any other means. Cows are frequently injured in their milk by not having their udders thoroughly cleansed after calving, and for the first fortnight or three weeks after. When the calf is about a month old, it is suffered to run with the cow in the day, and kept from her in the night till the girl comes to milking in the morning, when she again robs the calf of part of the cow's milk; this practice by some is followed till the calf is weaned. Some let the calves go with the cows when three or four weeks old, at which time the cow has not a greater supply than sufficient for the calf alone, after which it is allowed to run with the cow till about twelve weeks, when it is weaned, and put in a confined place out of sight and hearing, to prevent the cow being made uneasy from hearing her calf. The calf is then fed on cut grass, clover, or other green food, with hay and bran, till such time as it forgets its dam. It should then be turned

out upon good pasture, for unless the calf be well fed at an early age it will become stinted in its growth, and when arrived at maturity will not fatten so readily as if proper attention had been paid to it whilst young.

In many dairy districts, it has been found desirable to rob the calf of the greater portion of milk; which has been accomplished by its being taught to drink skimmed milk in a lukewarm state, by the following means:—When the animal has fasted two or three hours, the first and second finger of the right hand are presented to its mouth, of these it readily takes hold, sucking very eagerly; in the mean time, a vessel of lukewarm milk is placed and supported by the left hand under the calf's mouth, and while it is sucking, the right hand is gradually sunk a little way into the milk, so that it may draw in a sufficient quantity without stopping the nostrils. Should, however, either from accident or from too sudden precipitation of the hand into the milk, the calf let go its hold, the attempt must be repeatedly renewed till crowned with success. About twelve weeks after which, for three or four weeks, they are fed with lukewarm milk and water. A small quantity of hay, ground oats or bran, and sometimes oil cake, is then placed within their reach, which induces them to eat. Towards the end of May they are turned out to grass, being taken in for a few nights, when they have tepid milk and water given them, which is usually continued, though gradually, in smaller proportions during the last month, till they are able to feed themselves, when they totally disregard it. It is then advisable to turn them into pastures where the grass is short and sweet.

Many attempts have been made to rear calves by artificial means, which by some is said to have answered very well, where the animal has been confined and shut up in the dark; which appears to us, from practice, to be injurious, and especially if the calves are intended for stock. We certainly have no practice which can answer so well as that where the laws of nature are strictly attended to, and the calf is supplied with nourishment such as nature dictates.

The greatest attention in fattening calves should be paid to cleanliness, without which neither will the calf fatten quickly, nor when fat be of a good colour; much risk will also follow in losing the calf from fever, which produces scouring. Chalk should be always before them to lick, which will counteract the acidity which is found in great abundance in the stomach of the calf when feeding on milk.

It is advisable in fattening calves to keep them quiet, and to allow them to suck the cow night and morning, taking the last of the milk, which is considered to be the most rich and nourishing. By this treatment the calf will gradually become sufficiently fat in eight or ten weeks, and when so, it is no advantage to keep it a day longer, as small veal, if fat, is preferable to large.

It is by some a practice to bleed calves weekly, after they are four or five weeks old, and always a short time before they are killed, by which course the veal is rendered whiter.

As castrating calves is an operation which ought not to be performed but by skilful practitioners, we shall refrain from giving any directions, recommending, the operation to be performed at the age of eight or ten weeks, as at that age the danger is considerably lessened. The animals should be kept quiet and warm after the operation, and if on the following day the scrotum should be much swollen and inflamed, the wound may be opened, and the coagulated blood removed.

OX.

The ox is an animal of great utility for various purposes of draught. The most valuable breeds for working are the Devonshire, Sussex, Herefordshire, Somersetshire, South Wales, and Glamorgan; but the Devon oxen are invariably the best workers. Steers are generally broken into work at three years old. Though few breeders work them at two years and a half old, it is still a system that cannot be recommended, as their work is of no proportional value to the injury they sustain in their growth at that early season. The oxen are worked principally in double yoke, until they arrive at six years old, when they attain nearly their full growth; if kept well, some farmers continue to work them till seven years old, when, unless worked poor they will have completed their full growth; and though they will fatten equally fast at that age, they will not pay any thing to the grazier by their growth. Many of the Sussex breeders fatten off their own oxen; others are sold to the arable farmers for work at three and four years old, and by them sold at the before mentioned ages, to be grazed by those who occupy rich pastures. In selecting these oxen for feeding, great attention should be paid to their handling soft and mellow under the skin, which should not be thick, and the hair rather long and soft. The colour is but of little consequence farther than as it denotes the distinct breeds of cattle.

An ox for labour should be kept in good working condition, his body should be full, short jointed, and well put together in every respect

The ox is naturally slow in its movements, consequently it would be very injurious to drive him beyond his regular pace Steers when first yoked should be treated gently, and worked very light for two or three hours in a day with steady oxen, so as to inure them to labour by degrees; by this method they will, in the course of a few weeks, be in a fit state to be taken into regular work. Those oxen that work together, should be of equal

strength and height, for if they are unequally matched, the weaker animal will be urged beyond his strength or natural powers, and receive great injury. If one has a slight advantage over the other, the chain from the yoke may be shifted so as to give the advantage to the weakest.

It is advisable at all times to be very careful not to over-work or over-heat the cattle in hot weather, as by so doing, the constitution will be materially affected.

Mr. Ellman has recommended the following system, as a succession for breeding and working cattle; the greater or lesser number depending on the means or inclination of the breeder. Save or rear for stock, fourteen calves each year; to do this, and to provide against accidents and other casualties, there must be not less than twenty cows and heifers for breeding. Two or three of the worst calves may then be suckled and fatted for the butcher.

14 Calves, of which nine male; eight for oxen, and one allowed for accident, or not taken to work.

14 One year old.

14 Two years old; of which eight worked a little at two years and a half.

14 Three years old; part of which taken for cows, and others, if not good, fattened.

14 Four years old; eight worked.

14 Five years old; ditto.

8 Six years old; fattened.

Thus twenty-four oxen are worked in common; eight three, eight four, and eight five years old; and a reserve is kept for breeding cows, and accidents.

The Earl of Egremont has pursued the following system to a very great extent:—The calves being dropped from December to the end of February, are weaned immediately, never letting them suck at all, the milk being given them for a few days as it comes from the cow. But for weaning on skim milk, they ought to fall in or about December, either a month before or after at the latest, and should then be kept warm by housing, by which means they will be equally forward with calves dropped in the spring, that run with the cows. With skim milk some oatmeal is given, but not till the calves are two months old, and then only because the number of calves is too great for the quantity of milk, therefore water and oatmeal are mixed with it to make it go further. But to this, heifers with their first calves are exceptions, for they do not become good milkers, if their calves are not allowed to suck for the whole season; with the second calf they are treated like the rest. In May the calves are turned to grass, and in the first winter, from the begining of November, they are fed upon uplands, rouens, or aftermath. The following summer they are at grass, and the succeeding winter on straw, with a turn on short rough grass; they have been tried on hay alone, but straw and grass do better. The same course is then pursued until three years old, when they are broken in at Christmas, and are only lightly worked until the spring, when their full portion of labour begins. Their winter food is straw, with a ton and a half of clover hay, from the beginning of January. They are previously kept on straw alone, yet are worked three days in each week.

It is a question, whether it is most advantageous to work oxen by the collar or harness single, or in yoke or bows double; we are of opinion that an ox cannot be too slightly encumbered in his labour, in which case a yoke is best, and being yoked double is a great advantage on all light lands, besides, working in pairs they are nearer to the draft, consequently possess greater power over it than when drawing in length. But those who hold the collar in favour say, there is a decided advantage in single ox carts, and by ploughing in length they walk in the furrow, consequently do not poach the land so much as when worked in pairs; they are of opinion likewise, that they can walk faster in harness when single, and work much easier. Many trials have been made on this subject, but we shall only notice two, which took place some years ago in Sussex.

In order to decide the respective merits of the two methods, it was agreed that an acre of land should be ploughed by two teams, the one of six oxen in double yokes, the other of four oxen in collars; and then again with four oxen in single yokes, against four in collars. In the first trial, the six in yoke beat the four in collar easily; and in the second, there were only three minutes difference. The work was equally well performed, but the ploughing must have been very light, as the last match was completed in four hours and ten minutes.

The Earl of Egremont has worked his cattle each way, in both road and field labour, and his Lordship confirms the opinion in favour of the old Sussex yoke.

GENERAL MANAGEMENT.

The general management of cattle will be best comprehended under the following divisions:—

1. Grazing.—2. Soiling—3. Stall-feeding.

1. Grazing.

Cattle ought not to be turned out to pasture until the herbage shall have attained sufficient maturity and luxuriance, or until, in the usual phrase, there is a full bite, and if it consist of artificial grasses, great precaution is necessary, at their first meal, lest they gorge themselves to excess, and become hoven or blown.

Daily inspection is obviously necessary for all grazing cattle, to prevent or remedy acci-

dents, to observe their progress and condition, and to put up those which are lying down to see if they are indisposed. Some of the best graziers recommend to put a certain number of cattle into each field where there shall be a sufficient pasture to maintain them during the summer, so that at no time the grass shall be very short or long, but to have a sufficient bite to fill themselves in proper time that they may lie down to rest. If in a dry season there is not a sufficiency of grass, some of the stock must be taken away, but if the grass increase upon the stock, more stock may be added, so as to keep the grass at an equal and sufficient length for the beasts.

In long-continued rains, even in the warmest season and upon the firmest lands, cattle remain in a comfortless state, from their bodies being constantly drenched and soaked with water: their perspiration is checked, and their bodily functions generally disturbed, they become dull, and losing their appetite, improvement is at a stand. At the same time, and from the same cause, the juices of the grass become thin and watery, at length putrid. In this state, instead of nourishing the animals when they so much stand in need of nourishment, their food scours and weakens them. Upon sound and wholesome soils, the cattle generally escape any farther ill consequences than a temporary suspension of their improvement, but on fens, and lands which retain the water stagnant, the case is of far worse consequence. If the stock escape disease, they will in a week or two lose as much flesh as it may have taken so many months to lay upon them, and afterwards it may be a long time ere they regain the thriving habit; but their bodies sodden with water, externally and internally, and the animal juices vitiated, dangerous fluxes frequently supervene, terminating in that species of consumptive malady commonly called the rot. It is extremely obvious how much more dangerous this case must be in the decline of the year, when the best preventive remedies are required.

The remedies plainly consist in dry meat and shelter. As soon as it shall appear that both the grass and the cattle are about to be affected by the continued rain, hay or even straw should be allowed; but it is far more safe to go farther, and remove the cattle, if not to shelter, at least to the driest situation which can be obtained, wet grass, with dry fodder, being carried to them. Malt combs are very good with this intent, especially in the winter, in which season, says Lawrence, I should deem it absolute destruction to suffer cattle to wander abroad, starving and rolling in deluges of water, and in alternate frost and thaw, did I not see many sober minded persons voluntarily and purposely practice it. It is found from experience, that cattle intended for feeding the following summer, thrive faster in spring, in the months of May and June, than those which have been kept confined on dry food during the winter, where there are tolerably dry pastures, that the cattle may not injure the land by treading and poaching.

In order to graze cattle to advantage, it ought to be a fundamental principle so to stock them that they may feed without restraint, besides which, as often as opportunity or other circumstances will allow, it will be profitable to change them from one pasture to another, beginning with the most inferior grass, and gradually removing them into the best. By this expedient, as cattle delight in variety, they will cull the uppermost or choicest part of the grass, and by filling themselves quickly, as well as by laying down much, they will rapidly advance towards a proper state of fatness, while the grass which is thus left, may be fed off with labouring cattle, and lastly with sheep. Hence it will be advisable to have several enclosures, well fenced and sheltered, and abundantly supplied with wholesome water.

2. Soiling.

By the term soiling is understood the feeding of cattle in a house, shed, or fold, with cut green food, instead of depasturing the field, or making the grass into hay.

Various articles are employed for this purpose, as tares, lucern, and meadow-grass; also barley, rye, oats, and beans, all in a green state, but red clover, either alone, or mixed with rye-grass, is the substance most commonly applied.

Soiling, according to Sir John Sinclair, is attended with the following advantages:—

1. *The Saving of Land.*—Exaggerated accounts have been given of the saving of land. Some have contended, that it is as one to seven, if not more. By accurate experiments, it appears that it may safely be stated as one to three, an advantage alone well entitled to the attention of the industrious and intelligent farmer.

2. *Advantages to the Fences.*—Where stock are stall-fed, fences are not so necessary, and in this way there may be a saving of land, and a diminution of expenditure.

3. *The Saving of Food.*—Animals destroy the grasses, destined for their food, when pasturing upon them, in many different ways:—By eating, by treading, by dunging, by staling, by lying down, and by breathing on them. Of these the first alone is useful. All the others tend to waste, and that waste is always in proportion to the richness and productiveness of the soil.

4. *The Improvement of Stock.*—This advantage is applicable to all the different sorts of stock, more especially in dry seasons, when pastures are apt to fail.

Working oxen derive great benefit from soiling. They are saved the trouble of collecting their food, after their work is over, and run no risk from noxious vegetables, or unwholesome water. They can fill themselves much sooner, and consequently have more

time for rest ;—and they can take their repose much better, in a stable or shed, with plenty of litter, than in an open field, where there are so many things to annoy them.

The experiments of soiling cattle, have likewise been successful. Young steers become more tractable for work ; and are exempted from many accidents and disorders to which they are otherwise liable. The size and the symmetry also, to which cattle may be brought, when thus kept constantly sheltered, in a progressive state of improvement, without receiving any check whatever, justifies the idea, that such stock will surpass those exposed to the vicissitudes of climate, and other inconveniences inseparable from the grazing system, though pastured on fields of the richest and most luxuriant herbage.

Milch cows may also be soiled with considerable advantage. it is always expedient to soil them in the middle of the day at least, especially in hot sultry weather, that they may not be tormented with flies in the field, nor induced to stand in brooks, or ponds of water, nor in the shade of spreading trees or hedges, by which much valuable manure is lost. The stock are thus kept in a healthier state, and the milk is of superior quality. During the flush of the season, the quantity of milk may be as great from good pastures, but when they begin to fall off, cattle, regularly and abundantly fed in a house, must be greatly more productive for the purpose of the dairy.

5. *Increasing the Quantity, and improving the Quality of the Manure.*—This advantage cannot be controverted. When land is pastured, the dung that falls upon it is destroyed in various ways, and does not go through the process of fermentation.—Whereas, by soiling, not only a greater quantity of rich dung is obtained, but it may be "*manufactured* to more advantage."—Besides, dung made in summer is always superior to that made in winter, for the warmth of the weather, promotes a rapid fermentation, and generates several valuable substances, the formation of which, the cold of winter, and the superfluous moisture of that season of the year, in a great measure prevents. By this means also, clay-land farmers are, in respect of manure, put more on a footing with turnip soils.

6. *Increasing the Value of Land Produce.*—There is certainly no mode, by which cultivated grasses will pay so well, as by soiling. In the neighbourhood of towns, the same land will produce at the rate of from 20*l.* to 25*l.* per statute acre, cut for soiling, which would be considered high at 9*l.* or 10*l.* if let in pasture. The expence of cutting the cut grass must, however, be deducted.

In conducting the soiling process the grass, whether natural or artificial, ought to be cut in the morning for the evening food, and in the afternoon for the morning mess ; the afternoon crop should be carried to the barn or some other convenient place, and spread out, in order to exhale its superfluous moisture ; and in rainy weather, both crops must be taken off the ground. Attention, however, ought to be paid to the due proportion to be cut ; and until that fact be ascertained, it is a good plan to measure each mess, and to chalk down the quantity in weight, which the basket, cart, body, or other vehicle, employed for carrying food, contains of the various articles used for that purpose. The practice will, at least, have a tendency to teach farm servants to observe method, the value of which is of considerable importance in all business, particularly in the various branches that are connected with or dependant on, a grass farm. On the supposition, therefore, that twenty-five pounds weight of green clover will be sufficient for one beast, where thirty-two head of cattle are to be fed, 1,200 pounds will be cut twice in the day ; thus eight acres, cut four times in the season of soiling, will, on an average, give one cutting in six weeks, or twenty thirty perches are cut daily. A man and a boy may perform all the work, and pay all the attention requisite in soiling that number.

That the soiling system is attended with great labour, in cutting,—collecting,—and conveying the food,—in feeding, and keeping the stock clean,—in carrying the manure to the fields,—and also occasions some expence in buildings, cannot be denied ; but surely these objections, are amply compensated by the advantages above detailed.—In all cases, therefore, where the soil and climate are favourable to the practice of soiling, there cannot be a doubt of its utility, and the propriety of its adoption.

3. Stall Feeding.

During the season when luxuriance smiles in our meadows, and the sources of pasturage are great, live stock are very easily managed, provided proper attention be paid to not overstocking the land ; but when cold nights arrest nature in its beauties, and winter puts on his dreary garment, depriving the agriculturist of the advantage of pasturage, and rendering him dependant on the store which his foreknowledge dictates to him to heap up for the winter, it is then that we find practical information not only desirable, but most important in directing us how to manage the stock in the best possible manner. For the following information we are principally indebted to John Ellman, Esq. During winter, cattle should be confined either in yards, in closes with hovels attached to them, where the stock may take shelter in unfavourable weather, or in stalls tied up singly, with collars or with bows and chains.

For young growing stock intended for working or breeding, hovels, with court yards, as they are called in Sussex, should be used, as nothing contributes more to their health and strength than giving them their liberty and suffering them to range while young ; but in doing which care should be taken to keep them in tolerable condition, as by being reduced in flesh at any season of the year, it injures both their growth and con-

stitution. The latter end of October is about the time they are put into the yards, from twelve to twenty in a yard according to its size. Mr Ellman considers twelve to be as many as should at any time be kept together. The kind of food given to animals should be suited to their ages. In the habit of very young animals there abounds, and seems necessary for their welfare, a great proportion of fluid, and therefore more succulent food may be preferable for them; but when they are more advanced and vigorous, the digestive powers being stronger, and time being requisite for the process of growth, provision less immediately nutritious, or of a coarser quality may suffice. A dry kind of food would appear to agree better with all animals in winter, when the perspiration is less than in summer; during which season, moister provisions would seem to be more suitable. When fed on dry food, and more especially if the quality is coarse, the stock should be well supplied with water, to promote its digestion in the stomach. It is, indeed, a good plan, previously to moisten any hay given to cattle, and in a less degree even to horses. The food generally employed for this description of stock in the yard is hay, or hay and straw mixed, it is the practice of some however to use turnips. Donaldson is of opinion that there is no way in which turnips can be used with greater advantage to the farmer than by giving the young cattle a daily allowance during the first two or three winters.

When they begin to feed on turnips, a gallon is sufficient, increasing the quantity to two gallons per day to each. These should be given the first thing in the morning in troughs or mangers, and again in the afternoon, and hay placed either in racks or cribs, morning and evening, after they have eaten the turnips. The white globe is the best to begin with and when they will eat these readily, the Swede turnip may be given in the same way, but in less quantities. Turnips should be carefully cut for calves in thin slices as in square pieces there is danger of choking, while in the former there is none. One great advantage arising from this mode of feeding is, it teaches the young stock to become docile and quiet. When coming two years old they should be treated in the same manner, giving them more turnips; three pecks per day may be then given to them. When rising three they will eat nearly a bushel per day, and will do very well with indifferent hay, but much straw should not be given except it be to tread under their feet for manure, or to litter them when tied up. Working oxen have been kept on oat or barley straw and turnips till after Christmas when hay has been short, and have been kept in a good state of flesh if not worked too hard. Care should be taken not to over-feed any cattle, nor to give more than they can eat up clean. If calves get too loose with turnips they must be more sparingly given.

In stall feeding cattle, regularity of fattening is of the utmost consequence, indeed of more than any unpractised person can conceive. Three times a day, precisely at the commencement of a certain hour, ought to be the regular observance, and cattle, particularly if corn-fed, require their fill of water. The easy, contented, and improving disposition of the cattle, and small waste of provender attendant upon this regularity, is a source of constant satisfaction to a superintending proprietor. The advantages of stalls particularly the double ones is a consideration in two points of view. First, that cattle in a fattening stall require to be kept tolerably warm both day and night, and secondly, each beast gets an equal share of food, which is not the case when several are put together in a yard or close. The stronger beasts getting the greatest portion, while the weaker fall short of their allowance. The food on which cattle are fatted in the stall consists of turnips together with hay, straw, oil-cake, oats, barley meal, rye, flour, bean-meal, and other similar materials, but the more succulent kinds of food as carrots, parsnips, potatoes, cabbages, mangold wurzel, &c are more generally employed.

Oil Cake has long been celebrated for fattening cattle, and is considered one of the speediest methods that can be adopted; it is usually broken into small pieces and given in the quantity of half a gallon night and morning, mixed with chaff, bran, ground oats, barley and meals of an inferior quality. As the price of the cake has of late years greatly increased, it has been proposed to substitute linseed jelly, which, when mixed with a due proportion of hay or meal, affords an excellent composition for stall feeding or fattening and is certainly greatly superior to the oil-cake itself. The process of making the jelly has been already described under the article *Flax* (page 137). Cattle fed in this manner will fetch as high prices at market as those fed in any other way.

Turnips also form a useful article for fattening cattle, but from their succulent nature are generally combined with cut hay to which a little barley or oatmeal is occasionally added. The turnips are sometimes steamed, which is a very excellent method, but the general practice is to give them in a raw state, previously sliced; an acre of turnips is enough to fatten a bullock, which, if put up in tolerable condition in the month of November, will be ready for the market in twelve or thirteen weeks.

Cabbage, combined with oat or pea straw, with the addition of good hay, will fatten oxen or bullocks in the space of five months, besides yielding a larger quantity of manure than almost any other article employed as winter food.

Parsnips, carrots, potatoes, and mangold wurzel. Parsnips are next in value to oilcake, they must not be given in too large quantities as they are apt to cloy the stomach, they should therefore be combined with other food, or if alone should not be continued for any

lengthened period. Carrots rank next to parsnips, but mangold wurzel has been found equal if not superior to carrots, and very little inferior to parsnips.

Potatoes, when cut and steamed, furnish an excellent supply of food, especially when combined with a comparatively small portion of other food, and in combination with turnips previously boiled, are considered more valuable in their application. J. H. Campbell, Esq. of Kent, a successful grazier observes that one hundred bushels of potatoes and seven hundred weight of hay are generally sufficient to fatten any ox that thrives tolerably well. The roots should at first be given in small quantities, which should then be gradually increased to one or two bushels per day, dry food being always intermixed, and the proportion of hay being uniformly regulated by the effect which the potatoes produce on the bowels. There ought to be at least *five servings* in the day; and according to the quantity of roots which a beast can be induced to eat with appetite, he will fatten the sooner of course, with less expense and more profit. The hay should be cut once, or if it be not very weighty, twice along and three times across the truss, so as to be in square pieces of eight or ten inches, in which state the cattle will both eat and digest it more readily, while their fattening is considerably expedited. The potatoes however need not be cut, according to Mr. C. except at first, in order to entice the beasts to eat them; but they ought always to be *fresh* and *clean*. No corn or meal is necessary unless it can be procured at a moderate price; in which case it would contribute materially to facilitate and of course to render more profitable the whole system of cattle feeding. Should a *scouring* be brought on by the use of raw potatoes, which often happens, the quantity of meal or other dry food given with them should be increased, until the beasts become accustomed to the roots, when this incovenience will cease.

Distillers' wash, and brewers' grains, molasses, &c. fatten quickly. Distillers' grains differ from the brewers in having a portion of rye frequently mixed with the malt, which renders them more naturally sour: but such acid masses can only, we conceive, be considered as preparatory to the more forcing and essential article of dry food; without which it is scarcely possible that any steer or bullock can acquire that firmness of muscle and fat, which is so deservedly admired, and considered as the criterion of excellence.

Corn can be used to profit only in seasons of very great abundance, when corn is cheap and beef fetching a good price, for although it must be admitted that corn-fed meat is superior in quality to every other, and the manure produced more valuable, still as cattle can be fattened more speedily, and at a cheaper rate by the usual methods, it is obvious that where profit alone is a matter of consideration, corn can seldom be employed to advantage.

The following excellent system of stall feeding, is practised by Mr. Howis, who farms extensively on Crowborough forest:

Each animal is accommodated with a manger and water trough, but no rack for loose fodder. When the beasts are first stalled, a proportionate quantity is given of cut hay and straw (steamed), with cracked beans or peas and Indian corn. The corn is increased by degrees; and the animal has always warm food given. Such is the enjoyment of the cattle, fed in this manner, that even the best hay is refused when offered without being steamed. Following this system, much less food is necessary.

Mr. H. gives working oxen

2 Bushels of oat straw, cut as chaff.
1½ Gallon of cracked barley or beans.
1½ Ditto pollard or bran.

But when potatoes are given which are always steamed, not quite so much corn is used; the chaff, barley, beans, or pollard, are mixed with half a bushel of potatoes and given to the cattle in a lukewarm state.

The above quantity is usually given to each beast daily, with a sufficiency of water; but should the beast not eat it up, the quantity is lessened.

This method Mr. Howis considers to keep the cattle in better heart, than feeding them on grass, or any other succulent food. They are always kept tied up in the stall when not at work. Hay is never given but when on the road, as a bait.

In feeding and fattening beasts he allows each, per day:

2 Bushels of oat straw, cut as chaff.
3 Gallons of cracked barley or beans.
3 Ditto pollard or bran.
½ Bushel of steamed potatoes.

They are fed twice a day, and a sufficient quantity of water given; when potatoes are no given, the chaff is steamed, Mr. Howis considering the above an excellent mode for fatten ing, though perhaps it does not force quite so fast as oil cakes, yet considering the expen being much less, and a greater quantity of manure made, he is amply compensated.

In winter, or when there is no pasture, he feeds his dairy cows (keeping them tied up stalls) on oat straw cut as chaff, with either bran or pollard, mixed with steamed potato This mixture is also given to the cattle in a lukewarm state. The quantity given to ea cow is regulated by their feeding, never giving them more than they can eat up clean, w a sufficient quantity of water. By thus feeding them, he is of opinion that they giv

greater quantity of milk, and of better quality, than from any other kind of winter food. In summer they are turned to pasture or grass, without any other food being given them.

The relative proportion of food consumed by fatting beasts necessarily varies, according to the size of the animals, and the nutriment afforded by the respective vegetables. It has however, been found, that an ox will eat something less than one fifth *per diem*, of his own weight of cabbages. Fattening beasts require about eighteen stone of turnips daily, beside an adequate allowance of dry meat to counteract the superabundant moisture of these roots. An acre of twenty-five tons, therefore, will fatten a beast of sixty stone, or something more. For middle-sized animals, a bushel, or a bushel and a half of distillers' or brewers' grains will be sufficient, if combined with an ample portion of cut hay, chaff, or bean straw, given between the intervals of allotting the grains. Bullocks or oxen, varying from forty-five to sixty stone, consume about eight or ten stone of carrots or parsnips *per diem*, beside an additional quantity of dry provender; that is, in the proportion of one-sixth part of their own weight; and as a good acre of carrots will yield 400 bushels, or 22,400 lbs. it would support such an ox 160 days, a period sufficiently long for beasts to be kept that have had the summer's grass. If they are half fat when put to carrots, an acre would probably be sufficient to fatten two such beasts. Of potatoes, small cattle (such as those of Wales and Scotland) eat every day about one bushel per head, in a raw state, with an allowance of one truss of hay divided between four beasts. To an animal of eighty or one hundred stone, about eight to ten pounds of pulverized oil-cake are given each day, with half a stone, or one stone of cut hay, in addition, every day, for seven or eight weeks, which allotment of cake is then usually increased to twelve or fifteen pounds, until the animal is sufficiently fat for sale.

But whatever articles of food may be given, they ought to be apportioned with as much regard to *regularity of time and quantity* as is practicable; and if any small part be at any time left unconsumed, it should be removed before the next feed is given, otherwise the beast will loath it.

Of equal, if not superior, importance with regularity in feeding, is *cleanliness*, a regard to which is admitted, by all intelligent breeders, to be one of the most essential requisites to the prosperity of cattle. Hence not only ought they to be supplied with abundance of pure water, but also whenever they are brought into the stalls, either from pasture or from work, their feet ought to be washed, lest any filth should remain there, and soften their hoofs. Further: frequent washing, after hard labour, or at least once in the week, should be performed; and, though the practice of currying and combing, or of friction with brushes, cannot perhaps be adopted, or carried into effect, where the herds of beasts are numerous, yet, we conceive, they might be often rubbed with a wisp of straw, to considerable advantage. The mangers and stalls should likewise be kept as clean as possible; and the former, if they cannot often be washed, should be cleared every morning from dust and filth, which may be easily effected by means of a common, blunt-pointed bricklayer's trowel: they otherwise acquire a sour and offensive smell from the decay of vegetable matter left in them; which nauseates the cattle, and prevents their feeding. After the stalls have been cleansed by constantly removing the dung and sweeping the pavement, a sufficient quantity of fresh litter ought to be strewed over, which will invite them to lie down; for nothing contributes more to expedite the fattening of cattle, than moderate warmth, ease, and repose.

DISEASES OF CATTLE.

The diseases to which cattle are liable, are various and oftentimes dangerous; though careful attention to health, by good feeding and judicious management will greatly contribute to their prevention, yet by change of food, variation of temperature, and a variety of causes over which we have no control, cattle will sometimes become diseased, and consequently require the assistance of medicine. To describe the whole of the diseases incident to cattle, and the method of treatment for each, would greatly exceed the limits assigned us, we shall therefore confine ourselves more particularly to those maladies of the most common occurrence.

INFLAMMATORY FEVER.

Blackwater.—Quarter Evil.—Joint Murrain.—Blood Striking.—Blane in the Tongue.

These, and many other strange, but expressive appellations, are given to this disorder so frequently occurring, and so fatal.

Symptoms.

Without any, or very slight indication of previous indisposition, "the animal is found with his neck extended, the head brought as much as it can be into an horizontal position, the eyes protruding and red, the muzzle dry, the nostrils expanded, the breath hot, the mouth partly open, with an appearance of enlargement of the tongue; the pulse accelerated and hard, from 65 to 70 (the natural pulse varies from 36 to 40); the respiration laborious, with violent heaving at the flanks; a low and peculiar moaning; the senses sometimes

unaffected, but generally a greater or less degree of coma; rumination ceases; the beast stands for an hour or more without the slightest change of posture; can scarcely be induced to move, or when compelled to move, staggers, and that staggering is principally in the hind quarters. After a while he becomes more uneasy, slightly paws,—but it is oftener a change of posture to ease his tired limbs, than a pawing. At length he lies down, or rather drops, gets up almost immediately, is soon down again, and debility rapidly increasing, he continues prostrate, sometimes in a comatose state, at others with occasional but fruitless efforts to rise.

The fæces are slimy, and have more than their usual consistence. The urine is small in quantity, and high coloured. Sometimes the fever rapidly increases; it has no periods of intermission, and in twelve or twenty-four hours, the animal dies: but oftener other symptoms appear, and from which the common names of the disease derive their origin. The heat of the mouth, the laborious breathing, are considerably lessened. If the animal has fallen, he is, in a few cases, able again to rise, at least for a short time; or if he has not fallen, considerable lameness in the hind quarters, or in one leg, (in some rare instances one of the fore legs), is seen. If this apparent return of strength continues, we augur well as to the issue of the disease; but it is too frequently temporary and deceptive. The beast is very tender on different parts of the body; can scarcely bear the slightest pressure on the loins; there is considerable swelling about the shoulder, back, or loins; and the part, when pressed on, either indicates serous effusion, or gives a peculiar crackling, emphysematous noise, as if some gas were extricated in the cellular membrane. large scurfy spots, and even sores, frequently and rapidly succeed, with ill-conditioned ulcers about the muzzle, belly, or teats. The mouth and tongue are blistered or ulcerated, and a discharge of offensive, sanious, or bloody fluid takes place; or there is considerable hæmorrhage from the nose or mouth. The breath smells horribly; the urine becomes darker coloured, or bloody; the dung likewise has streaks of blood, and both are exceedingly fœtid. In this state the animal may continue one, two, or three days; when it either becomes gradually exhausted and dies, a mass of putridity, or the fœtor gradually ceases, the swellings diminish, and the strength returns.

If the beast dies in the inflammatory stage, the post mortem appearances are,—venous congestion, in every part of the frame. There is almost uniformly inflammation of the pluræ, intercostal and pulmonary; and inflammation of, or congestion in, the substance of the lungs; likewise peritoneal inflammation, and more particularly of the mucous membrane of the intestines, and chiefly of the colon, with slight ulceration.

When the disease has assumed a putrid type, there is considerable fœtid effusion in both the thoracic and abdominal cavities, with flakes of coagulum on the mediastinum and agglutination and adhesion of the small intestines. Sometimes vomicæ in the lungs; at others not the slightest appearance of inflammation; the lobes of the lungs either emphysematous, or compressed according to the quantity of fluid effused. Effusion in the pericardium, and that membrane, and the heart itself intensely inflamed, with spots of extravasation. Inflammation in all the compartments of the stomach, with ulceration in the fourth. The substance of the liver broken down and putrid. Inflammation of the mucous membrane of the intestines, with ulcerations generally in the jejunum and ileum, always in the colon and rectum. In the cellular membrane, beneath the integuments, large patches of extravasation, running fast into gangrene; and where this is not found, a yellow, or discoloured purulent discharge, following the knife.

Mr. Youatt remarks that the excessive and general muscular action which these symptoms display, warrant him in denominating the disease *inflammatory fever*. It is not mere febrile action, but that of the most intense nature, and consequently of short duration. It either terminates in sudden exhaustion of the powers of the frame, or more probably effusion on the brain; or it speedily changes its character, and assumes a malignant form.

Causes.—It has been said that the malady has very materially increased since the introduction of artificial grasses. We have no records of the diseases of cattle on which sufficient dependance can be placed. We do however, know that it is a disorder almost peculiar to beasts in high condition, that it occurs most frequently in the latter part of the spring, and occasionally in the autumn, when the grass is most luxuriant and nutritive; that it occurs most of all in cattle which are undergoing the process of fattening, and which have somewhat too suddenly been removed from scanty pasturage and low feeding, to profusion of herbage, and that of a nutritious and stimulating kind.

Treatment.—The very name of the disease, inflammatory fever, will indicate the mode of treatment. The first, and most important step, is copious depletion. Let from eight to twelve, or fourteen pounds of blood be substracted, and the bleeding repeated in three or four hours, if there be not evident amendment. If the disease so rapidly runs its course, it must not be trifled with. A bold and persevering use of depletory measures, can give the only rational hope of success.

Having bled, immediately purge. The best purgative for cattle, acccording to Mr. Youatt, is Epsom salts, sulphate of magnesia. The sulphate of soda is a good aperient, but inferior to the other. The first dose will be from fourteen to eighteen ounces, dissolved in a quart or three pints of thin gruel, and without any aromatics. Eight ounces should afterwards be given every third hour, until the bowels are freely opened.

As soon as this effect is produced, endeavour to depress the arterial action by nauseant or sedative medicines. Mr. Youatt confidently recommends digitalis, in these affections. The sympathetic influence, is principally on the circulatory system. The dose is from two scruples to a drachm, three times every day, and combined with tartarized antimony, and nitre. The first, as supposed to increase the insensible perspiration, and therefore determining the blood to the skin; the second as a refrigerant and diuretic. The dose has usually been one drachm of tartarized antimony, and three or four of nitre. Setons in the dewlap, may likewise be inserted. Some country practitioners, and with very good effect, use the root of the black hellebore, instead of tape, for the seton.

If the beast is capable of being moved, it should be ordered to shorter and scantier pasture; but this is a matter of little consequence, because rumination has generally ceased, and the appetite has been quite suspended.

If these lowering measures fail of success, and the fever begin to assume a putrid or malignant type, the treatment will be materially changed. The bleeding must, be relinquished, except in cases in which the inflammatory stage seems to be yielding to the malignant one, and the animal has not been previously bled, then a single, and perhaps copious bleeding, would be advisable; but if the venesection has been pushed to a fair extent, it must now be suspended. What then is to be done? Some have spoken of antiseptics as counteracting the tendency to putridity. The various barks have been reommended; but Mr. Youatt never saw an instance of decided good effect from them, and he has seen cases in which from the too early or injudicious use of tonics the inflammation has suddenly returned, and the animal has been lost. He has usually given, and continues to give, gentian, two drachms, with ginger half a drachm, and combined with nitre two or three drachms: but he has not always been certain that mischief has not been done. The apparent debility, nay, even the swellings and crackling may be the consequence of unsubdued and excessive vascular action. The pulse will be the best guide: if it be hard, whether full or small, avoid stimulants, if soft and weak, yet not oppressed, stimulants may be admitted, and may be useful. This distinguishing of the pulse, requires both practice and tact: it is an indication as to the employment of remedial measures far too much neglected both in horse and cattle practice. The tuberosity of the posterior maxilla, is not so prominent in cattle, as in the horse, and does not commence so soon; the submaxillary artery, which is the most convenient for the examination of the pulse in cattle, as well as in the horse, is therefore placed considerably more posteriorly.

When there are enlargements about the knee, elbow, stifle, or hock, fomentations of warm water, or of herbs as a placebo, or stimulating embrocations may be used. One of the most useful embrocations is composed of equal parts of turpentine, hartshorn, and camphorated spirit.

When the stage of convalescence commences, slight tonics may be allowed (the gentian ginger, and nitre, are the best); but no mineral tonic should be administered.

Bran mashes, or malt mashes, in small quantities, may be given, and the animal turned into a field where the grass has already been cropped pretty close. In general cases, however, the most scientific and the most successful practice is, after having subdued the disease, to leave nature to her own energies, slowly and successfully to resume her wonted functions. A seton or a rowel might be retained with advantage, for three or four weeks.

The preventive treatment.—This is a very important branch of the art. When inflammatory fever begins to appear among the cattle, the farmer may be assured that he is making more haste than good speed, and that the disease of one indicates the danger of others. All who have been exposed to the same predisposing causes, should lose six or eight pounds of blood—have a good dose of Epsom salts, and be turned into a field of short and inferior keep, what John Lawrence appropriately calls a digesting place. Any considerable degree of heaving, inflammation of the eyes, heat lumps on the back, rubbing, should be regarded as a warning of the possible or probable approach of mischief. The loss of blood, the action of a purgative, and a repose of two or three days, and after that of a few hours every day, in the digesting place, would not retard the progress of fattening, but rather the contrary, while the vascular system would be relieved, and dangerous congestion be prevented.—*Youatt, Veterinarian*, vol. ii.

The modification of this disease, called *Blane*, is characterized by great enlargement of the tongue, and sublingual glands, protrusion of the tongue, and vesication and ulceration of the whole of the mouth, particularly along the under part of the tongue, and in the neighbourhood of the frœnum linguæ. The only method of cure, is freely and deeply lancing these vesicles, especially those along the lateral and inferior parts of the tongue.

CATARRH.

Hoose, Cough or Cold.

This affection is of very frequent occurrence. When cattle are so affected, let them be put under cover, warm mashes given, and the following powder administered, in a little warm gruel:

Take of Nitre, three drachms.
Tartar Emetic, half a drachm.
Mix

Or the following mixture:

Take of Barley-water, one pint.
Cream of Tartar, half an ounce.
Nitre, three drachms.
Mix.

Either of the above may be repeated, as occasion may require.

INFLAMMATION OF THE LUNGS.
——— BRAIN.—(*Frenzy Fever.—Sough.*)
——— BOWELS.—(*Red Colic.*)

The symptoms of these diseases similate so nearly to those of the horse, that it will be unnecessary to recapitulate them. The treatment must of course be the same.

DYSENTERY.

(*Slimy Flux.—Braxy.—Bloody Ray.—Scouring Rot.*)

This affection differs from diarrhœa, or simple scouring, as being accompanied with fever, the result of inflammatory action. The mucous structure of the intestines, is always the seat of this disease, and in its advanced stages, extensive ulcerations often take place. The discharge is characterized by its offensive odour, and by the mucous, stringy patches which may be discovered in it; and also by its heat, and smoking when voided. A little attention will enable any one to distinguish between the character of this discharge, and the fæces produced by the simple relaxation of the bowels. If in the early stages of the disease the inflammation is high, and the animal plethoric, blood-letting will be advisable, purgatives, proper attention to diet, and cordials if required, constitute the usual practice in these cases.

DIARRHŒA.

(*Scouring.—Scantering.*)

Diarrhœa is generally brought on by improper change of food, exposure to wet and cold, over driving, &c. It is essentially necessary that the animal be taken in-doors, and kept warm and dry. The treatment must be similar to that of the horse, (page 290.) The astringents (page 300) will be found useful.

Scouring in calves may be cured by giving a little powdered chalk in their milk, or the following draught, once or twice a day.

Prepared Chalk, half an ounce.
Opium, two grains.
Milk, half a pint.
Boil, and add a little suet when boiling.

COLICS.

These diseases arise from several different causes. Cattle are frequently attacked with a kind of spasmodic colic, very similar to that in horses. A colic called *clue bound, fardle bound*, is frequently brought on by indigestion or costiveness, which often ends in the *red colic*, if not timely relieved. Another description of colic proceeds from a relaxation of the bowels. All of which may be removed by a similar treatment to that recommended for the horse.

HOVEN.

Blown.—Blast.—Fog Sickness.

The complicated structure of the stomach of ruminating animals renders them peculiarly liable to this disorder, the paunch being a kind of reservoir into which the food is received.

In it the food is mixed with the animal fluids; the minute particles are passed onwards through the second into the third stomach, while the coarser parts are again sent up to the mouth to be further comminuted, by undergoing a second process of mastication.

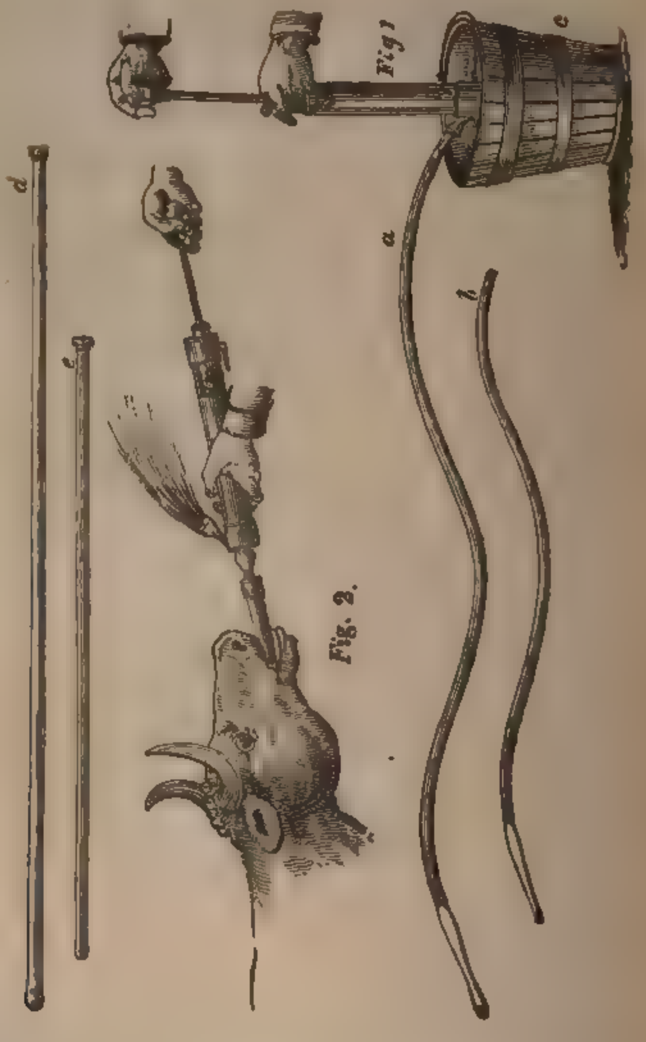
As the paunch is of an immense size in these animals, and as the green food which is taken into it is frequently much overcharged with moisture, and otherwise in a state which renders it liable to fermentation, it often happens that when the stomach becomes overloaded with this kind of food, the fermentative process goes on with a great degree of rapidity, in consequence of the stomach being as it were overpowered and unable to carry on the operation of digestion. This the more readily takes place, because there is a sweetness in the grasses, more especially in the aftermath, or second crop of clover, which induces the animals feeding on such food, frequently to take an undue quantity. In this fermentation a large quantity of air is generated, by which the stomach becomes so overdistended, that either a rupture of it takes place, or the respiration being interrupted, impedes the action of the diaphragm, and the animal becoming unable to breathe, dies of suffocation in a short time, perhaps in a few minutes.

When such is often the fatal nature of this disease, it becomes a matter of vast importance to know what is to be adopted as a remedy. The means that have hitherto been employed for this purpose are various. The first thing which it is desirable to accomplish, is to restore the tone of the stomach, so that its vital energy may, if possible overcome the disease. If this cannot be accomplished, a method is adopted of allowing the air to escape or removing the accumulated matter from the stomach.

To assist the weakened state of the stomach, it is found that any stimulant may be given with benefit; any spirituous liquors, as rum, gin, whisky, &c. in large doses; any oily fluid, as olive, linseed, castor, or even train oil, and melted lard or butter, but more especially the essential oils, and of these in particular turpentine; various stimulants, as the carbonate or water of ammonia, spirits of wine, and nitrous or sulphurous ether; aromatic seeds, as pepper, mustard, &c.; resins and gums, as tar and resin: various tinctures, as opium; several acids, as the acetic (vinegar) and aromatic acids; and alkaline earths, in particular lime-water. But although each of these has occasionally been found to give relief, there are cases that do not yield to such treatment, and recourse is then had to the introducing a hollow tube through the mouth and œsophagus, and allowing the air to escape through it from the stomach. If this does not succeed, or should the proper instrument not be at hand, an opening is made through the side into the paunch, by a penknife, or with a trocar and canula, and the air allowed to escape as it is formed. But there are cases in which, from the enormous quantity and solidity of matter taken into the stomach, even these means all fail, and an incision is then made through the side into the paunch, large enough to allow a person to introduce his hand and extract the contents; by this means animals are often saved. Such a formidable operation, however, from the manner in which it is performed, and the effects which frequently follow, ought if possible to be avoided. As there is a degree of play between the peritoneal surface of the stomach and the peritoneal lining of the parieties or sides of the belly, there is of course considerable danger of part of the matter, in the progress of extraction, getting into the cavity of the abdomen; and this, by producing irritation between the two surfaces, causes an inflammation to take place, which frequently destroys the life of the animal. And although these animals are less susceptible of inflammation in this membrane than what might be expected from its sensibility in other animals, still the danger consequent on such operations must be considered of sufficient importance to induce us, if possible, to avoid it.

The success which attended the operation of the stomach pump on the human subject and the high and deserved esteem in which it was held, called the attention of scientific men to the invention of a similar instrument for the uses of domestic animals; and the very ingenious one invented by Mr. Read, of London, for which he obtained a patent, has attained this object in a most satisfactory manner. This pump is calculated in an eminent degree to supersede the necessity of adopting the dangerous and frequently inefficient modes which we have enumerated, and to afford immediate relief to the animal. The pump is chiefly required for withdrawing fluids from the stomach. When the consistency of the mass however is such as cannot be operated upon by the pump, liquids can be injected by means of it, so as to dilute the mass, and the whole can then be withdrawn.—*Quarterly Journal of Agriculture.*

The following engraving, exhibits Read's Patent Veterinary Syringe for relieving hoven cattle, and clystering them. It consists of a syringe, (*Fig.* 1) to which tubes of different sizes are fixed, according to the purpose and kind of animal to be operated upon. There is a long flexible tube for giving an enema to horses and cattle (*a*), and a smaller one for dogs, (*b*). To relieve hoven cattle, however, it is not only necessary to free the stomach from an accumulation of gas, but from the fermenting pultaceous mixture which generates it: for this purpose a tube (*d*) is applied to the extremity of the syringe, and then passed into the animal's stomach through the mouth, as in *Fig.* 2., and being put in action, the offending matter is discharged by a side opening. When the same operation is performed on sheep, a smaller tube, (*e*) is used. The characteristic excellency of this apparatus is, that there is no limit to the quantity of fluid that may be ejected or extracted. The same syringe is used for extracting poison from the stomach of man, for smoking insects, extinguishing fires, and syringing fruit trees.



By this invention Mr. Read has conferred a permanent benefit on the breeder and feeder of domestic animals.

Such an instrument should be in the hands of every farmer; its cost would be more than repaid in a single operation, by the saving of the life of one of his cattle. Its simplicity, too, is such as to render it capable of being employed by any individual, the only necessary preliminary being that the head of the animal be held in a proper position.

LOSS OF THE CUD.

This is looked upon by most cow leeches, as a disease; but it is to be regarded more as a sign of a disordered state of the stomach, than an affection of itself, indeed it is quite evident that any attack upon the digestive organs, sufficient to disorder the appetite, will cause the loss of the cud. In such cases the treatment consists in the employment of stimulating tonics, such as a mixture of aloes, pepper, and gin.

STAGGERS.

Vertigo. Daisey. and Turning.

The over-feeding of cattle frequently brings on this disease. It frequently shows itself in such as have been suddenly moved from low keep to rich pasturage. The treatment in this case is bleeding and purging.

INFLAMMATION OF THE LIVER.

Hot Yellows.

The symptoms of this affection are very similar to those of the horse, but from the presence of the cystic bill in the ox, there is a more determined yellowness of the eyelids, mouth, and nostrils. The treatment must be similar.

Yellows is distinguished from inflammation of the liver, by the absence of fever ; there is a great yellowness of the eye-lids, mouth, and nostrils, and the cattle are remarkably dull. Among the earliest symptoms of this disease, a hard and inflamed appearance of one of the *quarters of the udder* may be mentioned, the milk assumes a yellowish cast, and is of a slimy consistence. Brisk purgatives, alteratives, change of pasture, and if possible salt marshes, is the only treatment.

INFLAMMATION OF THE KIDNEYS.

Red Water.—Black Water.

This disease is often traced to some peculiarity or luxuriance of pasture, indeed in some fields the cattle are rarely free from it. The over-distention and rupture of the blood vessels of the kidney, causes a discharge of bloody urine or red water. There are some who believe this disease is not inflammatory, but depending rather on a debility of the vessels of the kidney, and therefore recommend spirits of turpentine, but it would appear that the debility is the result of the inflammation or congestion, and therefore blood-letting and the other means pointed out under inflammation of the kidneys in the horse should be adopted. Black water is only the aggravated and latter stage of this disease.

PUERPERAL FEVER.

Inflammation of the Womb or Calf-bed.—Milk Fever.

Many cows die of this disorder, which is produced either from being too fat at the time of calving, from having been fed improperly, from the calf having been disunited in the womb, and having thereby its position changed, or from the force and violence employed in delivery. Not only inflammation of the womb is thus produced, but such exhaustion of the vital powers, that the fever which follows quickly proves fatal. The only remedies to be employed are, bleeding, a mild laxative, and a clyster. Cordials and anodynes are sometimes employed; such as ale with a little toast in it, or some preparation of opium. There may be cases where the cow after calving appears languid and weak, and where such medicines are useful, by giving temporary energy to the system, and thereby hasten the expulsion of the after birth ; but whenever there is much fever, which is indicated by the quickness of the pulse, difficult breathing, pain, and want of appetite, cordials would be improper.

Puerperal or milk fever is seldom cured, but may always, or almost always, be prevented by keeping cows as much as can be in the field, and when it becomes necessary to give hay, to give such only as is of the best quality. It is advisable, also, to keep them in a situation where they can have shelter in wet and cold weather.

INVERSION OF THE WOMB.—PROLAPSUS UTERI.

Falling down of the calf bed.

This is a complaint, or rather an accident of frequent occurrence among cows at the time of calving, and consists of the womb being turned inside out and falling down. It frequently proceeds from the force employed, in extracting the calf in laborious parturition, and drawing away the placenta or cleansing immediately after, before the womb has had time to contract or lessen itself. In these cases it is proper to support the calf when just out of the shape, and then tie the naval-string a few inches from the naval, with a little thick twine, and let the cleansing be expelled by the throes of the beast.

Treatment.—As soon as the falling down of the womb takes place, care should be taken to have in readiness a clean sheet to put underneath and around the womb, if the animal lies down, or to support it if standing; and likewise to protect it from particles of dirt or straw adhering to it, as also from the effects of air. Then, if any portion of the cleansing adheres to the womb, it must be removed in the gentlest manner possible, lest injury be sustained. Afterwards bathe the parts that are exposed with warm water. As soon as the parts have been bathed, endeavour to return it into its natural situation, by the following method :—" The womb is to be raised, and the person who replaces it should clinch his hand, or have a large sponge in it, and press gradually into the middle part of the womb, until it is returned into its proper situation. He must thrust it forwards as

far as possibly he can reach, and turn his hand round to feel that it is properly replaced, and hold it there for sometime, which will stimulate the womb to contract, and prevent it in a great measure from falling down again. As soon as the womb is properly replaced, it will be necessary to give the cow an anodyne drench. Mr. Clater recommends the following:—

Take gentian, white ginger, and grains of Paradise
in powder, of each one ounce;
Aniseeds, fresh powdered, two ounces;
Solid opium, cut small, one drachm;
Treacle, four table-spoonfuls.

Mix, and put the whole into a pitcher, then pour a quart of hot ale upon the ingredients, and administer when in a lukewarm state. This drink should be repeated once a day, or every other day, for two or three times. Warm mashes and proper management must be strictly attended to.

MANGE.

Cattle are not unfrequently exposed to this cutaneous affection, which is produced by improper feeding in the winter season. The uneasiness it occasions makes the animal rub itself so violently against walls, gates, trees, &c. that the hair is completely taken off by constant friction, and the skin becomes rough and wrinkled. Opening drenches, and a field with bare pasture should be the first things, and a liniment composed of—

Train oil ten ounces,
Spirits of turpentine three ounces and a half,
Sulphur four ounces

Should be mixed up, and the mangy parts well annointed with it once a day. In very bad cases of mange, the parts should be first well washed with soap and warm water, and afterwards hard scrubbed with a brush; then touch the sores slightly with a wash composed of—

Spirits of salts half an ounce,
Corrosive sublimate two drachms,
Dissolved in fifteen ounces of water.

This last lotion should only be used in desperate cases of mange, where the former liniment has been ineffectual in removing it.

PUCKERIDGE, PROOF WORMS, WARBLES.

Warbles are created by the bite of a stinging fly, which lodges one of its eggs in the part bitten, a worm is created from this egg, and by its irritation produces a tumour, which at last [b]ursts, and discharges its foul matter and with it the worm. They seldom attack beasts whose blood is in a pure state. In spring and summer they are most troublesome. The cattle much annoyed by them should be removed to a very bare pasture or common, and the warbles will soon be removed. The introduction of a hot wire is sometimes had recourse to, to remove them. Strong sulphur ointment may also be tried.

LICE.

Beasts poorly and improperly fed, and exposed to cold and wet weather, are sometimes swarming with lice. The *mange* liniment as already directed, or strong tobacco water, will destroy them. Cattle so affected should be turned into a wholesome but short pasture, where exercise would be promoted as they consumed their food. When they have recovered sufficiently, they may be removed into closer pasture.

WARTS.

The process for the removal of warts is short and simple. Cut them off as close as possible to the root with a sharp knife, let the part bleed freely, and then bathe it with tincture of myrrh, solution of blue vitriol, or Friar's balsam. This will be quite sufficient. Warts may also be removed by tying a tight ligature round the base.

WOUNDS, BRUISES, &c.

Are treated like those of horses. It sometimes happens, however, that the goring with the horns penetrate the cavity of the belly, and cause the intestines to protrude, in which case they should be carefully returned; the parts brought together by sutures, taking care, however, lest inflammation follow, to remove all dirt or other matter that may adhere to the parts.

FOUL IN THE FOOT.

This disease is often the effect of accident, though sometimes it comes on of itself. The only remedy is to keep the parts clean and free from dirt, and apply the following stopping:—Horse and cow dung of each two pounds, tar half a pound.

NECTARINE.

Nectarine (*Amy'gdalus pérsica, var. nectarina*), Icosándria Monogy'nia, Linn.; and Rosáceæ, Juss.

The nectarine is only a variety of the peach, the former producing a smooth, the latter a downy fruit. There are various instances on record of both fruits growing on the same tree, even on the same branch; and one case has occurred of a single fruit partaking of the nature of both.—(*Hort. Trans.* I.)

There are seventy-two varieties of this tree enumerated in the catalogue of the Horticultural Society. The following are among the best:—

FREE.—STONES.

Elruge.—Fruit middle sized, dark red towards the sun, pale yellow on the opposite side, flesh soft, melting, fine flavor. Ripens the end of August or beginning of September.

Fairchild's Early.—Fruit smallish, red color, flesh firm and high-flavored. Ripens the beginning of August.

Scarlet.—Fruit rather small, fine scarlet towards the sun. Ripens about the end of August.

Temple's.—Fruit middle-sized, pale red towards the sun, flesh rich and juicy; when over ripe it shrivels, and then the flavor is exquisite. Ripens about the middle of September.

Violet Hâtive.—Fruit middle size, purple towards the sun, flesh juicy and good flavored. Ripens about the middle of September.

White Nectarine.—Fruit above the middle-size, cream-colored towards the sun good flavor, but a rather shy bearer, Ripens the middle of September. This variety is less subject to blight or canker, and succeeds better upon a chalky soil than any other.

Duc de Tillo.—Fruit larger than any other variety, purple towards the sun, and bright red on the under side; flavor exquisite. Ripens about the middle of September. Tree hardy and a great bearer.

Murray.—Fruit middle size, dark red, almost black towards the sun, juicy and high flavored. Ripens about the end of September.

CLING.—STONES.

Late Newington.—Fruit middle-sized, flesh rich and juicy, ripens about the middle of September. The smooth leaves of this variety readily distinguish it from the *Early Newington*, which has jagged leaves.

Red Roman.—Fruit large size, dark red towards the sun, flesh rich and juicy, ripens about the middle of September—fine fruit.

Italian or Brugnon.—Fruit middle-sized, deep red, towards the sun approaching to black, fine flavor, ripens about the end of August.

Golden, or Yellow.—Fruit large, round, flavor peculiar, ripens about the beginning of October.

Early Newington.—Fruit above medium size, deep red, and according to Miller, one of the best flavored of nectarines, or of any known fruit in the world.

Culture, &c.

The same in all respects as the Peach.—See *Peach*.

USE.

The fruit in its raw state at the dessert.

OAK.

The oak (*Quércus*), Monœ'cia Polyándria, Linn.; and Amentáceæ, Juss.

The oak—The monarch of the wood—" in point of strength, durability, and general application, claims the precedence of all timber; and to England, which has risen to the highest rank among the nations, mainly through her commerce and her marine, the oak, " the father of

ships," as it has been called, is inferior in value only to her religion, her liberty, and the spirit and industry of her people."

There are above forty different species of oak introduced into this country, all of which are timber trees in their own countries; but they are either of too slow a growth, or of too delicate a nature, to attain a profitable size in this country. The two native species are most generally cultivated:—

1. The Common Oak, (*Quercus Pedunculata*).
2. The Sessile-fruited Oak, (*Quercus Robur*.)

"Little attention has hitherto been paid by the collectors of acorns, to distinguish between the two species just enumerated; but this, like the gathering of seeds in general, is committed to those who know or care little about the matter. This, however, deserves attention, as the merits of the Quercus Pedunculata are evidently much greater than those of the Quercus Robur, and is readily distinguished from the latter, by the circumstance of the acorns being placed on *long foot stalks*, whilst those of the *Robur* are nearly *sessile*; and, independently of the superior utility and hardness of the timber, the pedunculated oak is, in fact, the most magnificent of the two British species."

Culture, &c.

SOIL.

The oak will grow in almost any soil, but it thrives best in strong deep loams, incumbent on gravel or limestone rocks. It attains a majestic stature in the oak tree clay of the wealds of Sussex, Kent, and Surrey. "A tenacious clay, varying in colour from a yellowish brown to a dark bluish grey, and containing beds of limestone and sandstone, forms, as its name implies, a soil peculiarly favourable to the growth of the oak; the tracts of country in which it predominates producing the finest timber in the country."—*Mantell's Geology of Sussex.*

PROPAGATED.

By Seed.

1. The seeds of the oak are called acorns, they are usually ripe by the middle or the end of October, at which season they may be collected. In gatheriug seeds choice should be made of the finest trees, as they are more likely to produce a healthy and vigorous progeny, than those which are ill grown and stinted in their growth.

2. *Time of sowing.*—Acorns are often sown immediately after being gathered, and in that way succeed perfectly well; they are also often kept in sacks, or on a dry floor till February, when they are sown with nearly the same success.

At whatever season, however the seeds are sown, whether in autumn or spring, a much less difference will attend the result than is allowed by some, if the seeds have been carefully selected, and the ground properly prepared for them, plants from either sowing may be expected to prosper equally well. It is important that the ground be sufficiently prepared for the reception of the seed, for if it is not done at the time of sowing it cannot be done afterwards. For this purpose, it should be deeply and finely dug, and rendered fine and smooth by the use of the rake, and if the ground be not in a tolerably rich condition, a moderate supply of well-rotted manure may be added.

3. *Manner of sowing.*—The acorns may either be sown in beds or drills, but the latter is by far the best way where the intention is to allow the seedlings to stand in the seed-bed more than one season before transplanting. They should be equally distributed either in the drill or on the bed, at about the distance of half an inch apart from each other, or rather more, and covered to the depth of two inches.

After sowing, a watchful eye must be kept on the beds or drills, to guard them from the attacks of mice or rats, either of which would be equally destructive to them before they begin to vegetate.

4. *After-culture.*—The after management of the oak does not in any respect differ from that of the fir or other timber trees.—See *Fir*.

TREE.

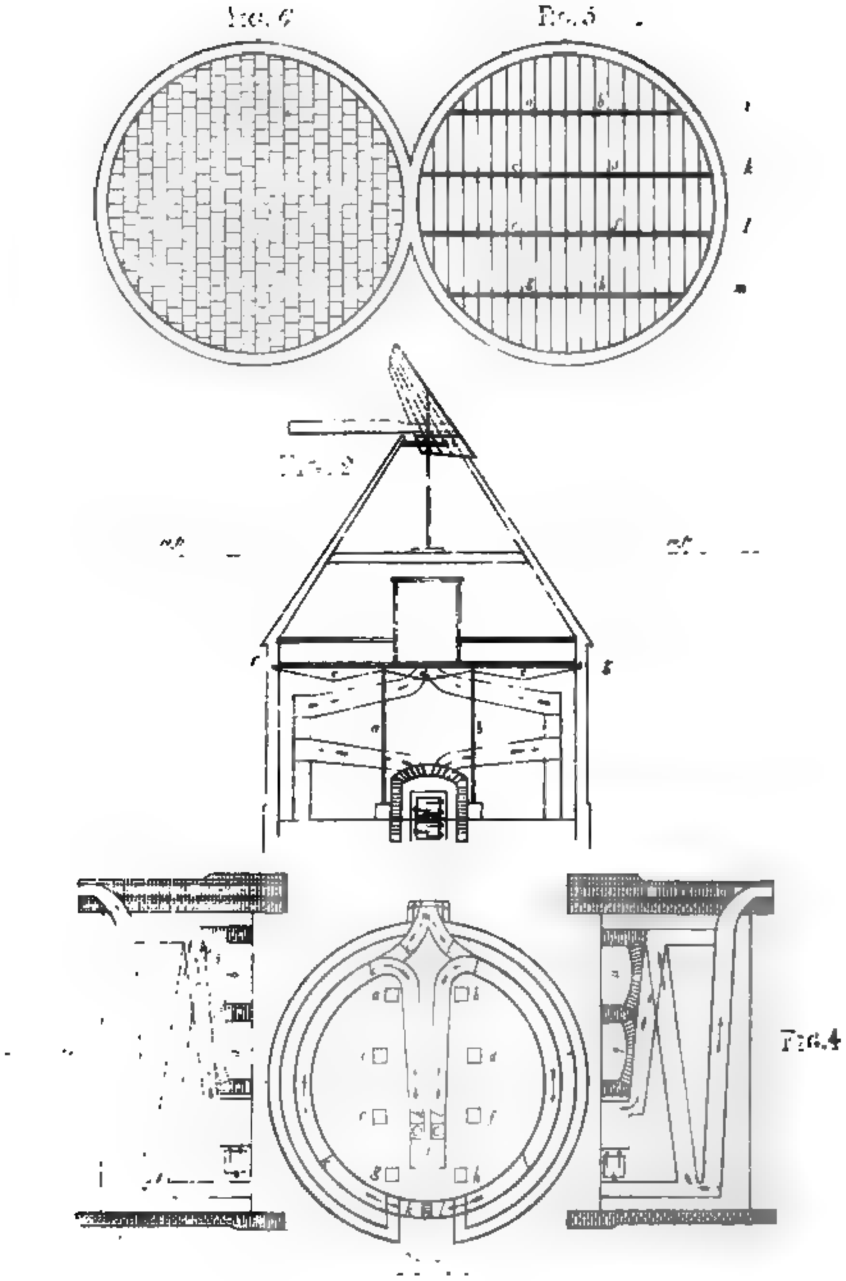
Oaks that have stood two years in the seed-bed, and which have been afterwards planted out into nursery lines for one year more to strengthen, may be considered the best plants for successful planting, as at that period they are better furnished with root fibres than when of a greater size or age.

USE.

1. The tree is chiefly grown for its timber, which on account of its durability, is extensively employed in constructing the "wooden walls of old England," the pride and glory of Britons.

2. The bark is used for tanning, and when it has performed its office to the tanner, it is employed by the gardener to produce heat by its fermentation.

3. Oak saw dust is used in dying fustians, and different shades of drab and brown are also made from it.



CIRCULAR OAST HOUSE. 387.

4. Oak apples form an excellent substitute for galls, and with copperas produces a more beautiful but not so permanent a black.
5. Acorns form a very acceptable food for swine and deer.

OAST HOUSE.

A DESCRIPTION OF THE CIRCULAR OAST OR DRYING HOUSE FOR HOPS,

By J. Read, Esq.

The circular shape gives a greater area than any other geometrical figure upon the same space, and is also more substantial. The roof is brought within eighteen inches of the drying floor, and consequently less materials are required, and the whole structure is erected at less expense than a square building capable of drying an equal quantity of hops in the same time. Windows or ventilators are indispensable at the base of the building, to admit freely the ingress of air for supporting the combustion of the fuel in the cockle, and carrying off the vapour. In an oast house of this description, any kind of fuel may be employed.

Reference to the Diagram.

Fig. 1.—*Ground plan,* shewing the brick quoins, a, b, c, d, e, f, g, h, for the bases of the iron columns which support the drying floor; i, the cockle; k, l, the double flues issuing from the cockle, and extending to m, the chimney.

The course of the flues is shown by a flight of arrows.

Fig. 2.—*Elevation of the kiln.*—a, b, The iron columns, supporting c, d, e, the girders (of the same metal) on which the drying floor, f, g, is laid. This figure represents a front view of the cockle and flues.

Figs. 3 and 4.—*Section of the flues,* on either side, from the cockle to the chimney.—The whole course of the flues are supported on brick arches, the first two only of which, a, b, are represented in the diagram.

Fig. 5.—*The metallic floor* or frame, shewing a, b, c, d, e, f, g, h, the heads of the columns; the girders, i, k, l, m, and laths which support the tiles, or drying floor.

Fig. 6.—*The drying floor,* constructed of earthen tiles, 12 inches square, perforated with clusters of conical canals issuing from circular excavations below, and terminating in small apertures above.

The advantages of this kind of oast are numerous, but the following may be selected as among the most prominent.

1st The building is less expensive and more durable. The fact will be evident to every practical builder who will perceive that the roof commences at 18 inches only above the drying floor, and therefore saves 4 feet 6 inches in the height of the building, as compared with the usual construction of oasts; it also renders unnecessary the use of expensive plates and tie beams, and the roof admits of being formed of slighter timbers than would be sufficient for a square figure. The building is more durable, because, being circular, the pressure is equal, and it is braced from all sides. Kilns upon this plan are built from twelve to twenty-two feet in diameter.

2nd. Having a tile floor, the building is exempt from the danger of taking fire.

3rd. The expense of fuel is considerably lessened by the facility of heating the house by the turns, returns, and the continuation of the flues within it. The quantity of caloric or heat given off, is of course in proportion to the extent of surface of the radiating body, and as the heated flues are the medium through which the heat from the cockle is communicated to the drying floor, it necessarily follows that an increased length of the flues must augment the quantum of heat passing from their extended surfaces, every inch of which throws off its portion towards the general accumulation. It should be observed also, that it is highly useful to *blacken* the flues, and *whitewash* the walls, because, agreeably to the laws of radiation and reflection, the former more readily give out their internal heat from a blackened surface, whilst the latter by being whitened, are prevented from absorbing any of the heat transmitted by the flues, and become reflecting surfaces to throw it back into the house, to increase the general temperature, and thus to economise every portion of heat in the greatest possible measure.

4th. In comparison with opposite methods, an oast of this construction dries a double quantity of hops in the same time. Two bushels to every square foot of floor may be brought off every twenty-four hours.

5th. The hops dried in this kiln are found to keep better than those which are otherwise cured, and the sample altogether improved in quality in consequence of the *rapidity of drying,* it being acknowledged by all persons experienced in the preservation of vegetable substances that their natural qualities and appearance are more effectually retained by their being dried

quickly. The injury often sustained by the hops from the presence of aqueous vapour, is also obviated by the contraction of the space at the top of the building, by which its condensation is prevented, and its escape facilitated.

35, Regent Circus.

OATS.

The oat *(Avéna sativa)*, Triándria Digy'nia, Linn.; and Gramíneæ, Juss.

There are many varieties of this grain, but the best and most productive are the following:—

1. The common long-tailed white oat, known by being long and very pointed at one end.
2. The Red Oat, known by its red husk and kernel, and more thin and flexible straw.
3. The Poland, known by its thick white husks, short stiff straw, and solitary grain.
4. The Black Foxglove or Tartarian Oat, known by its black husks. A very hardy and productive variety.
5. The Potatoe Oat, known by its short thick kernel, and rather long straw.

There are many other varieties, but as they are seldom cultivated, it will be unnecessary to describe them.

Culture, &c.

Soil.

Oats will grow upon almost any soil, from a stiff clay to a light sand or bog, provided they are laid sufficiently dry. As this grain does not require a particularly fine tilth, very little labour is required in the preparation of the soil, the land being seldom ploughed more than once.

Propagated.

By seed sown either broadcast or in drills, the quantity of course varying considerably, according to the state of the land and the manner of sowing the seed, Upon stiff or cold soils from five to six bushels per acre will be required, and the same quantity upon poor soils if sown broadcast; but if drilled, from four to five bushels will be found sufficient. Upon strong loam or hazle moulds a less quantity will be required; from three bushels and a half to four bushels and a half will be sufficient. Oats may be sown with advantage after any green crop; they are sometimes sown after wheat, but it is not a course to be recommended. They succeed best after turnips, rape, or clover, and upon all fresh broke up land extraordinary crops may be expected, unless the plant in its early growth is destroyed by the grub or worm.

Preparation of the soil.

If oats are to be sown on a *wet stiff soil* (or after wheat, which is rarely done,) it is necessary to plough the land in the autumn, laying it in ridges or lands from three to four feet wide, and sufficiently round to allow the water to pass off quickly into the furrows; by this means the land will be freshened and mellowed by the frost, and consequently a better tilth will be got for the reception of the grain. On soils of this description February is considered the best month for sowing.

On all light dry or sandy soils oats should be sown much earlier than they generally are; the beginning of January, if the season will admit, will not be too early; that they may, in their early growth, have all the benefit of the moisture, and well cover the ground before the heat of the summer sets in. Land of this kind requires ploughing but a few days previous to sowing.

On strong rich fertile soils oats will not require sowing so early, as from the greater strength of the soil, they will grow much quicker than on a soil of a poorer description. This land requires ploughing but a short time previous to sowing.

On all light soils it is advisable, *immediately* after *putting* in the *seed*, and, on *all* lands as soon as the *plants are three or four inches high*, to apply the roller. By this operation, light dry porous soils are greatly benefitted, as it enables them to retain the moisture more perfectly; at the same time, by pressing the earth to the roots, the growth of the plants are materially promoted. When the soil is worked up lightly, moisture either filtrates through it too quickly, or is too easily evaporated; in a dry season this may occasion a very great deficiency in the crop, more especially on a light soil.

Oats are ready for the scythe or sickle when the grain becomes hard, and the straw changes to a yellowish colour. It should, however, be cut before it is dead ripe, to prevent the scattering of the grain.

Use.

1. The grain in its entire state is chiefly employed as food for horses, and in its ground state is extensively used for cattle, sheep, pigs, and poultry. The entire kernel is used for gruel, and forms an article of commerce known by the name of embden groats.

2. The straw, if well harvested, is good winter food for cattle; the straw of the black or white oat is preferable to the red for this purpose.

ONIONS.

Onion, (*A'llium Cépa*), Hexándria Monogy'nia, Linn.; aud Asphodéleæ, Juss.

The common onion is a well known biennial plant, of which the following distinct varieties have been described by Mr. Strachan, *Hort. Trans.* vol. iii.

1. The Silver Skinned.—Flat, middle sized and shining, chiefly used for pickling.
2. Early Silver Skinned.—A subvariety of the other, smaller, and excellent for pickling.
3. Yellow.—Small, globular, strong flavored, and good for pickling.
4. Two-bladed.—Flat, small, brownish green, has few leaves, ripens early, and keeps well; one of the best for pickling.
5. True Portugal Onion of the Fruiterers.—Large, flatly globular, mild, does not keep well.
6. Spanish, Reading, White Portugal, Cambridge, Evesham, or Sandy Onion.—Large, flat, white tinged with green, mild but does keep very well, good for a general crop, much cultivated round Reading.
7. Strasburgh, Dutch, or Flanders Onion.—The seed being generally procured from thence; or Essex Onion when the seed is saved in that county; oval, large, and light red tinged with green, hardy, keeps well, but of strong flavor; by far the most generally cultivated in England.
8. Deptford Onion.—Middle sized, globular, pale brown, a sub-variety of the Strasburgh, and very generally cultivated.
9. Globe.—Large, globular, pale brown tinged with red, mild, and keeps well; very popular among gardeners.
10. James's Keeping.—Large, pyramidal, brown, hardy, strong in flavor and keeps well originated some years ago by James, a market gardener, in Lambeth Marsh.
11. Pale Red.—Middle sized, flattened, globe shaped, pale red, strong flavor, keeps well.
12. Blood Red, St. Thomas's Onion, Dutch Blood Red.—Middle sized, flat, very hardy, deep red, strong flavor, and keeps particularly well; much grown in Wales and Scotland; in the London market it is esteemed for its diuretic qualities.
13. Tripoli.—The largest onion grown; oval, light red, tinged with green and brown, soft and mild, but does not keep long after it is taken up.
14. Lisbon.—Large globular, smooth, bright, white and thin skin, tardy in ripening, but hardy, much used for autumnal growing; seed generally obtained from the south of France.
15. Welsh Onion, or Ciboule, (*Allium fistulosum*).—A native of Siberia; hardy, strong in flavor, but does not bulb, sown in autumn for drawing in spring.
16. Under-ground or Potatoe Onion.—Multiplies itself by the formation of young bulbs on the parent root, and produces an ample crop below the surface, ripens early, but does not keep beyond February: flavor strong.
17. Tree or Bulb-bearing Onion, (*Allium cepa*, var. *viviparum*).—Originally from Canada where the climate being too cold for onions to flower and seed, they are allowed to throw up flower stalks, the flower becomes viviparous, and bears bulbs instead of flowers; here it retains the same habit. It is more an object of curiosity than use, though in some parts of Wales, Milne informs us, the cauline bulbs are planted and produce ground onions of considerable size, while the stem supplies a succession of bulbs for the next year's planting. It is considered stronger, and to go farther as seasoning, than other onions.
18. Scallion.—A term generally given to the young green tops of onions in the spring, which do not bulb, or to the shoots from bulbs of the preceding year. Miller mentions it as a distinct sort; some consider it the Welsh onion, and Milne thinks it may not improbably be the hollow leek, a species of *Allium* grown in Pembrokeshire and other parts of South Wales, with roots in clusters, like that of shallots.

For early use the Portugal and Spanish yield the largest crops. For principal or main crops, the Strasburgh, Deptford, and Globe, are generally preferred; The silver skinned and two bladed, are considered the best for salads and pickling. The potatoe onion is occasionally planted as an auxiliary crop, and the Welsh onion for drawing early in the spring.

Culture, &c.

SOIL.

The onion prefers a rich, mellow ground, on a dry subsoil, being well manured with well consumed dung, buried in at a moderate depth some time previous to the sowing season. In digging, the ground should be broken as fine as possible.

Picklers are grown upon poor light ground, to keep them small.

The market gardeners, at Hexham, sow their onion seed on the same ground for twenty or more years in succession, but annually manure the soil.

After digging and levelling the ground, the manure, in a very rotten state, is spread upon it, the onion seed sown upon the manure, and covered with earth from the alleys, and the crops are abundant and excellent in quality.—*Hort. Trans.* vol. i.

PROPAGATED.

1. *By Seeds,* which may be sown either drilled or broadcast; the latter mode is however generally practised, and for a bed five feet by twenty, two ounces of seed will be required, but when sown for a full bulbing crop, one ounce of seed will be sufficient for a bed twenty-four feet by five, and for a bed the same size to be drawn off for transplanting in the spring, three ounces will not be too much.

2. *Times of sowing.*—For the main crops, to bulb at the end of summer, sow towards the end of February, if the weather be mild, and the ground dry; otherwise, to avoid frost, or where the soil is wet and heavy, sow from the beginning of March to the middle of April, finishing by the latter period at farthest. For picklers sow late in April. For crops to draw green in the course of summer, for salads, make successive sowings from April to July, and for a similar return to last till the close of autumn, sow in the last week in July. For a winter standing crop to be partly drawn young, in the course of winter and spring, and to afford a reserve for early summer bulbers, make two sowings in August; the principal quantity in the first fortnight, and a smaller sowing the end of August. The Strasburgh is the least liable to be cut by the severity of winter.

3. *General culture of the summer crop.*—Allot an open compartment of ground, and tread it into beds of convenient width, from three to five feet, and sow the seed in the above proportions, and rake it in evenly, lengthways of the beds, being careful to cover the seeds well among the mould. Keep the beds at all times clear from weeds, and when the plants are three inches high, thin them out, leaving the plants standing at five or six inches apart, for the full bulbing crop; but what is better, leaving a bed, or part thereof, thinned only to three inches, in order to allow for drawing young onions for present use, by successive thinnings, to the above distance. The plants will begin to bulb in June, and attain full maturity in August, which is discovered by the leaves beginning to turn yellow and decay, and the shrinking of the neck, when they may be pulled up, spread on a compartment of dry ground in the full sun, to dry and harden completely, turning them over every two or three days, and in ten days or a fortnight they will be ready to store up for winter and spring use. The grossest part of the top must be cleared off previously to storing, and frequently turned over, and the decayed ones picked out.

4. *General culture of the winter standing crops,* to have young onions to draw off in spring, for salads, &c. The Deptford and Strasburg are the most proper sorts of the bulbing kinds, but the Welsh is the most hardy. For this purpose allot a spot of ground that is rather more light than that for the summer crop, and lying on a dry subsoil, and in a warm, sheltered situation, and the beds may be three or four feet wide, to suit convenience; the best time for sowing is the same as that for cabbage seed, viz. from the sixth to the twelfth of August, making a general rule to sow both on a day, if all circumstances allow. Distribute the seed very thick, and rake it in evenly, without treading, as recommended and practised by some. When the plants are come up, weeding must be carefully attended to, before the weeds spread and overrun the ground, but the plants should not be thinned, but remain thick for their chance in winter, and to be thinned by degrees, as required for salads in spring.

The Welsh onion must be sown and managed in the same way, but it will lie down in winter, and rise again in spring, in February and March. Any of the bulbing kinds remaining unthinned in spring, in April or May should be thinned to six inches distance, and kept clear from weeds, and they will form ripe bulbs in June and July.

5. *Transplanting onions.*—This practice is strongly recommended by Knight, who observes that all bulbous rooted plants, and indeed every plant that lives longer than one year, generates in one season the sap or vegetable blood which composes the leaves and roots of the succeeding spring. "This reserved sap is deposited in, and composes in a great measure, the bulb; and the quantity accumulated, as well as the time required for its accumulation, varies greatly in the same species of plant under more or less favorable circumstances. Thus the onion in the south of Europe acquires a much larger size during the long and warm summers of Spain and Portugal, in a single season, than in the cold climate of England; but under the following mode of culture, which I have long practised, two summers in England, produce nearly the effect of one in Spain or Portugal, and the onion assumes nearly the form and size of those thence imported. Seeds of the Spanish or Portugal onion are sown at the usual period in the spring, very thickly, and in poor soil

generally under the shade of a fruit tree; and in such situations the bulbs in the autumn are rarely found much to exceed the size of a large pea. These are then taken from the ground, and preserved till the succeeding spring, when they are planted at equal distances from each other, and they afford plants which differ from those raised immediately from seed, only in possessing much greater strength and vigour, owing to the quantity of previously generated sap being much greater in the bulb than in the seed. The bulbs thus raised often exceed considerably five inches in diameter, and being more mature, they are with more certainty preserved in a state of perfect soundness through the winter, than those raised from seed in a single season.

Mr. Brown, of Perth, instead of sowing under the shade of trees, as recommended by Mr. Knight, picks out all the small onions, from the size of a pea to that of a filbert from his general crop. If the sown crop fails, he can always trust to the transplanted crop as a reserve.

6 In transplanting spring sown onions, great care should be taken to keep the incipient bulbs above ground, covering them as lightly and loosely as possible, for the fact is, surface bulbs, as the onion, turnip, &c. are always prevented from attaining their full size by the operation of earthing, whatever they may gain in other respects.

Use.

In spring, young onions are used in salads, and when bulbed and mature, in soups and stews, and for these purposes are cultivated by every class of society in Europe.

Culture, &c. of the Under-ground Onion.

Mr. Maher (Hort. Trans. vol. iii.) describes the following mode of cultivation as practised by him at His Grace the Duke of Norfolk's garden, at Arundel Castle. "As early in the spring as the weather will permit, I prepare a piece of ground by digging and dunging it well; this is formed into beds four feet wide, on which I draw lines the whole length, three to each bed, and with the end of the rake handle, make a mark (not a drill) on the surface; on this mark I place the onions ten inches apart; I then cover them with leaf mould, rotten dung, or any other light compost, just so that the crowns appear exposed. Nothing more is necessary to be done until they shoot up their tops; then on a dry day, they are earthed up like potatoes, and kept free from weeds when they are taken up. In the west of England, where this kind of onion is much cultivated, I understand, it is the practice to plant on the shortest day, and take up on the longest. The smallest onions used for planting, swell and become very fine and large, as well as yield offsets; the middle sized and large bulbs produce great clusters."

Mr. Wedgewood, who objects to this mode of treatment, says: "I am myself a grower of these onions, but do not entirely agree with Mr. Maher in all particulars. I will state wherein I differ from him. His method of planting is very good, but in the subsequent treatment I believe he is wrong. I never use the hoe to the plant, except for clearing the ground from weeds, when the onions have shot out their leaves to their full size, and when they begin to get a little brown at the top I clear away all the soil from the bulb down to the ring, from whence proceed the fibres of the roots; and thus form a basin round each bulb, which catches the rain and serves as a receptacle for the water from the watering pot, I find that the old bulbs then immediately begin to form new ones, and if they are kept properly moist, and the soil is good, the cluster will be very large and numerous.

This is not the only advantage of this mode of treatment, as the bulbs thus grown above ground are much sounder than those formed beneath the surface, and will keep much better, indeed I find them to keep quite as well as any other sort, but this was not the case until I adopted the plan I have described."

Use.

This variety has of late years been much cultivated in the Isle of Wight, and on the coast in the vicinity of Portsmouth, as it comes in use before any of the spring-sown ones which enables the cultivators to find a ready market for them or the purveyors of the East Indiamen, and other ships destined for long voyages, which leave England at a season when no other onions would be in a condition to take into their stores.

ORCHARD.

On the Management and Pruning of Orchard Trees, by C. Harrison, Esq. F. H. S.

The situation of an orchard ought uniformly to be one that will admit of a free circulation of air and the direct influence of the sun. It should be well protected on the eastern side, as the blossoms of the trees are frequently injured by cold easterly winds and frosts.

In the following remarks, I propose, in the first place, briefly allud-

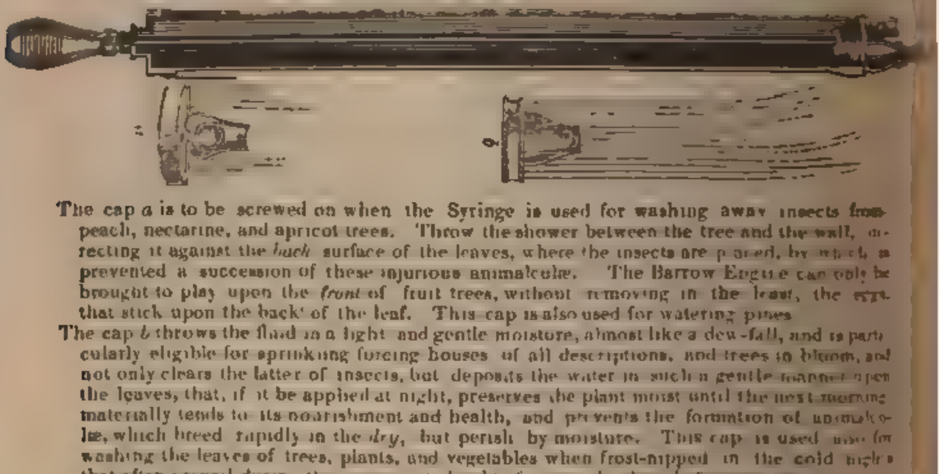
ing to the nature of the soil adapted for orchard trees; secondly, the manner of pruning orchard trees; thirdly, the method I adopt for destroying insects, lichen, &c. injurious to the growth of orchard trees.

1. *Soil.*—The substratum ought to be dry, so that moisture can be readily carried away: otherwise trees planted will be liable to become stunted in their growth and mossy, and consequently, unhealthy and unfruitful, or the fruit very inferior in size. Attention to make the ground dry, (provided it is not naturally so) will be amply repaid, by the greater fruitfulness of the trees. This may be done by trenching over the ground and then, while the trench is open, laying at the bottom a number of brick bats or small stones, &c. and over these something to form an even surface, the whole must be well beaten or rolled, and a number of cross drains so constructed as to conduct the moisture away by one main or central drain.

2. *In Pruning Orchard Trees* care must be taken to prune away the branches so that no two of them rub together, thereby causing them to canker. The interior of the head, ought always to be kept open, otherwise the trees will moss and close up the pores of the wood. The trees always bear more abundantly if trained to and kept in a conical form, the horizontal form of the branches causing them to be more productive of blooming buds than otherwise they would be, and the trees are never so confused in this form as in others. Every winter the trees should be carefully looked over, and all unnecessary wood taken away, as it is far better both for the health and fruitfulness of the trees to do it every year, than to suffer them to become crowded, and then once in ten or fifteen years cut away large quantities of wood.

3. *Insects, Lichen, &c.*—Persons who have an opportunity of collecting a quantity of soap-suds will find it of essential service to wash the trees with it at any time (excepting when in bloom) applying it by means of a small engine or syringe. This prevents insects breeding so extensively, as well as prevents moss and lichen increasing.

[For this, and other horticultural purposes, Read's Patent Garden Syringe seems admirably adapted. The annexed engravings and directions show its various applications.—Ed.]



The cap *a* is to be screwed on when the Syringe is used for washing away insects from peach, nectarine, and apricot trees. Throw the shower between the tree and the wall, directing it against the *back* surface of the leaves, where the insects are placed, by which is prevented a succession of these injurious animalculæ. The Barrow Engine can only be brought to play upon the *front* of fruit trees, without removing in the least, the eggs that stick upon the back of the leaf. This cap is also used for watering pines.

The cap *b* throws the fluid in a light and gentle moisture, almost like a dew-fall, and is particularly eligible for sprinkling forcing houses of all descriptions, and trees in bloom, and not only clears the latter of insects, but deposits the water in such a gentle manner upon the leaves, that, if it be applied at night, preserves the plant moist until the next morning, materially tends to its nourishment and health, and prevents the formation of animalculæ, which breed rapidly in the *dry*, but perish by moisture. This cap is used also for washing the leaves of trees, plants, and vegetables when frost-nipped in the cold nights that often prevail during the spring, it should of course be done before sun rise.

The cap *c* is used for extinguishing fire, and for washing all trees against walls, in lieu of the Barrow Engine, and in this way can be applied more efficaciously than the latter, as it may be brought into immediate contact with the plant, or applied in any direction that may be desirable, which the Barrow Engine cannot, on account of the impracticability of bringing it over the beds.

4. *Thinning the Fruit.*—It is of great importance to thin fruit as far as practicable, not only is the fruit left much finer, but that which is lost in number is more than compensated for by the increased size of those that are suffered to remain. The trees are more certain to mature fruitful buds, to produce fruit the following year, and the alternate bearing of crops is avoided, and each year may be equally successful, (unless by casualties) and not as is often the case, one year loaded to excess, and the following nearly barren. The time to thin the fruit is, when it is begining to swell.

In addition to the foregoing very excellent remarks of Mr. Harrison, the following plan for forming

An Orchard in Miniature, as proposed by a correspondent to the *Gardeners' Magazine*,

may, where space is an object, be adopted with advantage.—" By planting the proper sorts apples may be grown *on as small a space of ground as gooseberries:* and a small or large square, according to the size of families, appropriated to apples, will grow every year enough to supply their wants. I am not vain enough to think that I am alone in growing them in this way, as I should think horticultural economy would prompt many besides myself to gratify their eyes, their pockets and their appetites in so easy a way. I have my ground a strong clay mould, trenched 2 feet deep, in December; as soon as it is settled, say a fortnight after trenching, taking advantage of a frosty morning, the holes are opened and left for the frost to mellow. February is the best month for planting on heavy ground; by that time the earth taken from the holes will be in a fine pulverized state. The holes need not be very large; 2 feet over, and 1½ft. deep, will be enough; with some rich soils there will be no occasion for trenching; but then the holes must be larger, say 3 feet over, and 2 feet deep; the plants must be 6 feet apart every way; I arrange mine in quincunx. With a six-feet measuring stick this is done with scarcely any trouble. I really do not know any sight more pleasing to a domestic mind (for what fruit contributes more to our comfort than the apple?) than this orchard in minature, when covered with bloom, and again when laden with fruit, as they seldom miss bearing in abundance.

This plan will not extend to the strong-growing sorts, as they are not easily kept within bounds; but the following six will amply repay the trouble and trifling expence of planting. I have placed them in the order of their ripening:—Mank's Codlin, Hawthornden, Kerry Pippin, Downton's Pippin, Christie's Pippin, and the Old Golden Pippin. The trees must be chosen with stems not exceeding 1 foot 6 inches in height. In September I look over the trees, take off superfluous wood, and shorten the long shoots; this strengthens the bloom buds, which are formed abundantly upon the young wood of all the sorts named. Of course in doing this an eye must be had to the formation of the trees, which ought to be gradually brought into a handsome round bush. For the first five years a row of strawberries may be grown, between each row of apples or any other dwarf light crop; but strawberries are most in keeping, a word which, in every gardening operation ought never to be lost sight of. Let me add—they ought to be worked on Paradise stocks, or the small wild crab (mine are on the last) not by any means on the free stock raised from apple pips, the very worst stock that can be used.

Another correspondent (Mr. Howden we believe) in the 17th number of the very useful and interesting publication above alluded to, thus describes a very ingenious "plan for planting a piece of ground to the greatest advantage." In the winter of 1814-15, on account of some alterations of roads plantations, &c. a piece of land dropped into my hands, of an awkward shape for tillage, and rather too small for pasture; I therefore concluded to introduce a little spade husbandry; as the house was pretty near to the farm yard, the intercourse or advantages betwixt them would be reciprocal. Accordingly, having no gardeners, I set farm labourers to make so many ditches, four feet wide and two feet deep, at every twelve yards, clear across the whole; the turf and good soil were thrown on one side, and the bad soil on the other. The labourers wondered what such ditches could mean, as they were as wide at bottom as at top, and particularly when I ordered them to be filled up a foot thick with fresh farm-yard dung; and the turf, and what little good soil there was, chopped and thrown on the top of the dung. I had prepared a compost of turf and dung the year before, which was laid upon the whole, about nine inches thick, in which I planted fruit trees in the following order:—at every six feet in the centre of what I now call a border, was planted a standard, then a gooseberry, then a currant, then a dwarf, then a currant, then a gooseberry, then a standard, &c. I was not so particular as some are in my choice of fruit trees; I gave my nurseryman a kind of roving commission, to send me a couple of each of such as he could recommend, and then added two, four, six, or eight of such as I could recommend myself. On the edges of the borders I planted rows of strawberry plants, six inches apart, which I have only renewed about twice in ten years; the fruit is always excellent, and supplies a large family all the strawberry season, which saves much garden ground for that crop. The spaces betwixt the borders I cultivated at my leisure; some were appropriated for nursery ground, some for potatoes, peas, cabbages, &c.; some for experimental agriculture, lucern, mangold wurzel, &c. The orchard has succeeded beyond my utmost expectations. I had forty-eight apples from two Keswick Codlins, the first year, but have never had patience to count them since; last year I had at least seven bushels off the same two trees! Six dwarf Hawthorndens produced above fifteen bushels, and I have, at this moment two bushels of Wyker Pippins from one graft of my own putting in, only ten years ago. Two Dumelow's seedlings, planted twelve years ago, produced at least eight bushels of beautiful fruit, scarcely one of them less than ten inches round, and many of them twelve inches. The nonpareils are a very similar crop; as for the Mank's apple, &c. there are generally as many apples as leaves; and when in blossom they seem an entire bunch of flowers.

My Method of Pruning is particularly simple. It will remind you of the old way of pruning, or rather cropping the vines at the third eye. I do not stand counting eyes, but from every shoot that is three feet long I cut off two, and of course leave one; from such as are three inches long, I cut off two, and so on. The wood left forms buds for the following year, and as the tree gets crowded and out of shape, I take off a whole bough or branch with a saw. Any boy will learn to prune in a few minutes. [The lopping of trees, here suggest-

ed is, we must confess, a rather too unceremonious mode of procedure to be recommended as a substitute for the skilful application of the pruning knife.—Ed.] I cut out the large boughs myself. A few of my trees took to cankering, the Ribston Pippin particularly; my only remedy was to dig them carefully up, examine and prune both root and branch carefully, and plant them again in similar fresh soil; they never miss to recover and do well. My extraordinary success has induced me to write this, *pro bono publico*, as it has been the custom in this country, and many others, to prepare a foundation for fruit trees, at vast expence, by flagging, paving a gravelling in Mr. Harrison's manner, lest the roots get into the bad soil and canker, as the saying goes; but trees will never go into bad soil if they have plenty of good soil to go into, any more than cattle will go into bad pasture if they have plenty of a better quality. The roots of fruit trees do not and should not run deep into the soil; the borders should be occasionally top-dressed with good manure, and the alleys sometimes dug deep and fresh manure put into them. My borders are now full six feet broad, and the spaces between of course a little curtailed. I used to grow five rows of celery in the intervals, and now I can grow but four, but the fruit trees pay well for the ground they occupy."

A very excellent paper on the pruning and management of dwarf apple and pear trees, is published in the seventh volume of the Transactions of the Horticultural Society, in a letter addressed to the Secretary, by Mr. W. Greenshields, F. H. S.—"I herewith send you," says Mr. G. "a description of the method I have pursued in pruning and managing my dwarf standard apple and pear trees, and which I have practised for several years with success.

The first subjects of the following remarks, from their appearance, were planted six or seven years previously to the commencement of any pruning being given them. In consequence they required to be very much thinned out, so as to get the branches clear of each other. For thinning I always bore in mind to cut the old wood off close to the stem or branch it was attached to; this prevented young wood springing afterwards. When the trees were thinned of the old shoots, as above stated, the young side shoots were what is generally termed spurred in; that is, they were so shortened, that only two or three buds were left on them, and the leading top shoots were shortened to half their length.

The following and every succeeding year, the trees were treated in the same manner, as respects the young wood, till they had acquired the desired height, when the leading shoots were shortened, as the side, shoots or spurs had been previously. When the leading shoots shew an indication to grow very luxuriantly, which is apt to be the case under this treatment they should be prevented doing so, by cutting off part of the old wood, along with the young shoot immediately above a flower bud. This will prevent the shoot so cut from increasing in length. The spurs must be treated in a similar manner, by cutting off a small portion of the old wood along with the young, when they are getting too long. I have never found the above treatment prevent the fruit swelling, or in any way detrimental to it, but, on the contrary, it was always improved.

Young trees are to be treated in the following manner:—If there are more than three shoots on the plant, reduce them to that number, and shorten each to three, four, and six eyes, according to their strength. The following season reduce the number of leading shoots to six, and shorten them to three fourths of their length, and spur in the remaining shoots. The tree should be managed in every respect in this manner until it has attained the required size, which of course depends on the convenience or fancy of the owner, or conductor of the garden.

I make a point of letting the trees take their natural form of growth as far as the system described will permit, for I consider it of little consequence what shape is given to the tree, provided my end is attained; that is, to make every branch as it were a long spur, with bearing buds from the base to the extremity.

Two or three years' trial of this method only, might possibly deter many from a continuance of it, in consequence of the quantity of young wood which will be produced yearly at first, and from the apparent difficulty of getting rid of the superfluity. But the inconvenience will be ultimately surmounted if the foregoing instructions are attended to, and the continuance will be the possession of both healthy and fruitful trees. To attempt to bring very old trees into this method of management would be attended with difficulty, unless they were cut down short, and allowed to make new heads, which I should recommend where their produce can be spared for a time. In a few years fine healthy heads would be formed, which will yield fruit superior to any that could be expected from them, if left in their rude state. But if the trees cannot be spared to be headed down, they may be very much improved by thinning out the spray, and cutting out a few old branches, which will cause them to throw out young shoots, and these, in a short time, will become bearing wood. The remainder of the old branches may then be thinned out with effect. Even if this process is only performed once in two or three years, and the stems and branches well cleared of moss and dead bark, it will be of great service to the trees, and be a means of keeping them free from insects, and give them a neat and clean appearance.

PARSLEY.

Parsley (*Apium Petroselinum*), Pentándria Digy'nia, Linn; and Umbellíferæ, Juss.

The parsley is a hardy biennial, the root-leaves of which are compound and much curled in some varieties. There are three varieties in cultivation:—

1. The Common Plain-leaved.—Seldom cultivated.
2. The Curled Thick-leaved.—The best variety for cultivation.
3. The Hamburgh or Broad-leaved Parsley.—Cultivated for its esculent ravish-shaped roots, which are boiled like parsneps.

Culture, &c. of the Garden Parsley.

The seed is to be sown in good clean earth, in drills, as edgings to borders or garden plots; or it may be raised in beds in the compartments. The drills are to be made about half an inch deep and nine inches asunder, the seed is to be sown regularly and not very thickly, and covered with fine earth. The plants will not rise in less time than a month or six weeks, as the seeds do not germinate rapidly. One sowing will furnish a supply for a year, or even for sixteen months; but it will always be prudent to sow annually in March or in November, to come in early in spring. Then in June or July, when the plants grow rank and full, they may be cut down nearly to the surface, which will cause them to sprout afresh full and stocky, and these will continue in perfection during the winter, and till the fresh grown plants come into season In July of the second year they will shoot up for flower, and produce ripe seeds in the autumn.

Culture, &c. of the Hamburgh Parsley.

Dig a piece of light ground in an open situation. Sow the seed thinly and regularly, either in shallow drills eight or nine inches apart, or broadcast over the surface; and rake it in, making the earth of the bed level by patting it gently with the back of the spade. When the plants attain the height of two or three inches, thin them out till they stand six inches asunder at the least. Keep the beds free from weeds, and the roots will grow to a considerable size by the autumn, and continue fit for use during the winter.

USE.

1. The leaves of both varieties of the common garden parsley are used as pot herbs at every season of the year, but the curled variety should alone be cultivated, as many fatal accidents have occurred from mistaking the poisonous plant called *fool's parsley* (Æthusa Cynapium), a common weed frequently growing in rich garden soils, for the common plain-leaved parsley. They are, as Neal observes, "very easily distinguished: the leaves of fool's parsley are of a darker green, of a different shape, and, instead of the peculiar parsley smell, have, when bruised a disagreeable odour. When the flower-stem of the fool's parsley appears, the plant is at once distinguished by what is vulgarly called its *beard*, three long pendant leaflets of the involucrum."

2. The roots of the Hamburgh parsley are drawn in autumn and winter, like parsneps, for the table, and are by some esteemed a very delicate dish.

PARSNEP.

The Parsnep (*Pastináca sativa*) Pentándria Digy'nia, Linn.; and Umbellíferæ, Juss.

The parsnep is a hardy biennial of easy culture, there are four varieties:—

1. The Common Parsnep.	3. The Hollow-crowned Parsnep.
2. The Guernsey ditto.	4. The Turnip-rooted ditto.

Of these the common parsnep is the only variety generally cultivated.

Culture, &c.

SOIL.

The parsnep prefers a light rich deep soil, which should be free from stones, and trenched full two spits deep previous to sowing; the manure, if employed at the time of sowing, should be thoroughly decomposed, and intimately mixed with the soil.

PROPAGATED.

By seed, sown either broadcast or in drills, in February or March. The manner of forming the seed-beds, the quantity of seed required, and the after-culture of the plant are in every respect similar to that of the beet and the carrot.—See *Carrot*.

Preserving the crop.—The parsnep is not so liable to be injured by the frost as the carrot, if suffered to remain in the ground; but it will be better, however, as soon as the leaves begin to decay, to take up a portion of the roots, which may be preserved in sand under cover. The remainder may be taken up in February, and if preserved in sand will keep good till the end of April.

USE.

1. The root is employed as a culinary vegetable, and in Catholic times was a favourite *Lent* root, being eaten with salted fish.

2. The parsnep affords, by proper management, one of our best, cheapest, and wholesomest home-made wines.—See *Wines*.

PEA.

Pea (*Pisum Sativum*), Diadélphia Decándria, Linn.; and Leguminósæ, Juss.

The pea is a hardy annual, and a universal favourite; it is a native of the south of Europe, but the period of its introduction into this country, is merged in obscurity, it certainly was not common, as Loudon remarks, in the time of Elizabeth, as Fuller informs us that peas were brought from Holland, and were "fit dainties for ladies, they came so far and cost so dear." The varieties of peas are very numerous, and as they are extensively cultivated, both in the field and in the garden, we shall, as in the case of the bean, divide them into two classes, the one adapted for the field, the other for horticultural purposes.

Culture, &c. of Field Peas.

VARIETIES.

Grey.	*White.*
1. Early Grey, or Partridge Pea.	1. Early Charlton White.
2. The Late Grey, or Hog Pea.	2. White Suffolk.
3. Marlborough Grey.	3. The Pearl.
4. Horn Grey.	4. The Golden Hotspur.

In the choice of varieties, when grown for the seed, the early of either the white or grey pea, is to be preferred; but when haulm is the object, the latter sorts are the most desirable. Peas sown for gathering green, should be the Charlton or Suffolk, and when intended for splitting, the two last are also the best.

SOIL.

The pea will grow on almost any soil, but succeeds best on a dry and moderately light one. It may be grown on all fresh broken up lands and old leys with advantage, and it may often be found a beneficial crop where danger is apprehended from worm.

The preparation of the soil for the field pea, is precisely the same as that for the Bean; but fresh broken up lands will require frequent ploughings, for the purpose of destroying the turf or sod.

PROPAGATED.

1. *By seed,* which may be sown either broadcast or in drills. If sown broadcast, from two and a half to three bushels will be found sufficient; but for early sowing the larger quantity will be required. It is a practice with some to steep the seeds in water, for late sowing. If drilled, the quantity of seed must of course depend on the distances between the rows, which vary from twelve to eighteen inches; if twelve inches, three bushels will be found sufficient, and if eighteen, about seven pecks.

2. The time of sowing must in a great measure depend upon the intentions of the cultivator; if for podding, to be sent green to market, they must be sown in succession, from the middle of January to the latter end of March, but for general crops, they may be sown as early in spring as the season will admit.

PLANT.

1. *Should be weeded by means of the horse or hand hoe.* The use of the hoe in stirring the interval and earthing up the young plants where the crop is drilled, is of essential advantage in promoting their growth, and protecting them from the injuries of the season. When crops are hand hoed, it is necessary to be performed twice, the first when the plants are about two or three inches in height, and again about the period in which they blossom. By this method the vigor of the young crop is secured, and a fresh supply of nourishment afforded for the setting and filling of the pods. At the last of these hoeings, the rows should be laid down, and the earth well placed up to them, the weeds being previously extirpated.

2. *In harvesting peas* great care is necessary. If well harvested, the haulm is very valuable as winter food for cattle, independent of the pea being of a better sample. Immediately they are found to wither and turn brown they should be cut, for by suffering them to remain till they become ripe, a great loss in quantity will be experienced by the opening of the pods. They should be placed, after they are cut, in heaps or wads, and frequently turned, till they are perfectly harvested, when they may be removed into stacks or barns.

USE.

1. Peas are generally employed for feeding and fattening pigs, and are sometimes given to horses, in which case care should be taken not to give them in too green a state, as they have a tendency to produce gripes, and other bowel complaints. The white varieties are frequently split, in which state they are used for making soup, peas puddings and porridge.

2. In feeding swine, peas are much better adapted than beans. In the former case they will fatten much quicker, and the flesh will swell in boiling and be much better tasted, whilst on the contrary, the bean-fed hog will shrink in the pot, and the meat will be less delicate in flavor.

3. The haulm, if well harvested, is excellent winter food for lean stock, that of the white pea, if cut green, and dried quickly, is nearly equal in value to hay.

Culture, &c. of Garden Peas.

VARIETIES.

1. Early Frame,	14. Green do. or Patagonian	26 True Dwarf Scymetar,
2. Bishop's Early Dwarf,	15. Knight's Wrinkled or Marrow,	27. Sickle Pea,
3. Cormacks double-blossomed early frame.	16. ——— New Dwarf ditto.	28. Dwarf Blue Imperial,
4. Perkin's Earey ditto.	17. Spanish Morillo,	29. Improved ditto,
5. Early Charlton,	18 Blue Prussian,	30. Tall ditto,
6. —— Golden ditto.	19. White ditto.	31. New Green Nonpariel,
7. —— Nichol's Golden do	20. Egg,	32. Royal Dwarf,
8. Common charlton,	21. White Rouncival,	33. Leadman's ditto,
9. Early single blossomed,	22. Grey ditto.	34. Spanish ditto,
10. Reading Hotspur,	23. Tall Sugar	35. Prolific ditto,
11. Golden Hotspur,	24. Dwarf Sugar	36. Late Spanish ditto.
12. Dwarf Marrowfat,	25. Crown or Rose,	37. Early Dwarf Frame,
13. Tall ditto.		38. Nanterre, or Earliest French Pea.

Estimate of Sorts.

Of the varieties enumerated, Mc. Intosh considers " the early dwarf frame, Bishop's early dwarf, and the true early frame, the best for forcing, and with the early charlton, the best also for early crops in the open air. The charltons are profitable as well as early peas, and are suited for cottages, and small gardens, as are also the varieties of dwarfs, as they occupy little ground, and other crops of vegetables may be planted between their rows. Of the middling late growing sorts, the Blue Prussian and Dwarf Marrowfat are excellent bearers, and good flavored peas, and of the tallest, the tall marrowfat, and Knight's wrinkled marrow are the best. The latter is evidently, under good management, the best flavored and most profitable late pea that is now cultivated. Leadman's dwarf, is a good late pea, and much esteemed for its flavor. The sugar pea is used nearly in the same manner as kidney beans, the pods being destitute of the tough inner skin or membrane which every other variety possesses, are thereby very tender and delicate.

SOIL.

The pea will grow on almost any soil, if it be sufficiently rich, and of good depth. Recent manure should never be employed, but if the ground is so poor as to require manuring at the time of sowing, then well-decomposed manure should alone be used. For early crops, a dry soil and a sheltered situation is absolutely requisite ; for late crops, an open exposure, and a rather moist soil, is to be preferred.

PROPAGATED.

By seeds, which are always sown in drills. For a drill twenty yards in length, of the small and early kinds, a pint of seed will be required, but a much less quantity will be sufficient for the larger sorts.

For early sorts the drills may be made an inch and a half deep, but if the soil is wet, it will be better to sow the seed on the surface of the ground, or even upon ridges, the rows being three or four feet asunder. For summer and main crops, the drills may be two inches deep, and the rows four, five, or six feet apart, according to the sorts.

Periods of Sowing.

For an early crop a few drills may be sown in a warm, sheltered situation, in November or December. These may be ready for the table in May or June, but it is very uncertain, as it often happens, after all our trouble and anxiety to protect them during the winter, the crop is lost altogether ; and under the most favorable circumstances, the winter is seldom more than a week earlier than the spring-sown crops, and it is no unusual circumstance to find peas sown in the middle of February, producing fruit earlier and more abun-

dearly than those sown in October or November. The seed at this season of the year should be sown much thicker than is usually recommended, or disappointment will be experienced. A slight covering of coal ashes will be found a useful application, especially if the soil is stiff and wet. It not only resists the damp, but affords the plants considerable warmth as it is well known that blackened surfaces absorb the sun's rays more powerfully than any other.

The true early frame, the charltons and Bishop's early dwarf, are best adapted for early sowings: the early frame will fruit a few days earlier, but they are neither so hardy nor prolific as the charltons. Bishop's early dwarf, even in the richest soils, seldom attains a height of more than 12 inches, and is therefore well adapted for small gardens. For an early crop it may be sown close to the bottom of a wall, where it may be easily protected from the spring frosts, if found necessary, by placing a board lengthwise in front, with the upper edges resting on the wall and the lower on the ground. As this variety branches very considerably, the seed should not be sown less than an inch apart in the rows, the rows being 18 or 20 inches distant from each other. To produce an early crop, peas are often raised in pots or boxes, in hot-beds or forcing houses, and being gradually inured to the open air, are transplanted into warm borders, where they are finally to remain. Mr. Bishop recommends a method not so well known, as far preferable to that of pots or boxes, particularly where they are to be raised in a hot-bed. This consists in having a quantity of turf cut into pieces of about nine or ten inches in length, and three or four in breadth, which are placed in a regular manner over the surface of the bed, grass side downward, and a row of peas is sown upon each row of turf, and afterwards covered with soil: when they are fit for transplanting no more is required than to lift out the turf, piece by piece, with the peas growing upon it, and place them where they are to produce their crop. By this means the roots receive no injury; nor does the plant sustain the least check in transplanting. This method may be practised with similar success in the raising of potatoes, beans, &c.—*Gardener's Mag.* I [illegible].

The crops sown in October and November, and such as are above the ground, should be protected in severe weather with the pea *glass case*, which is a triangular frame of any convenient length, the sides being at right angles, and each ten or twelve inches broad. The front is glazed with small pieces of glass to transmit the light, and the back is composed of a board of the above breadth, the base is of course open. A handle is placed at the top of the case for the convenience of removing it from place to place. A frame formed of two boards nailed together lengthways, at right angles, will also be found very useful for protecting early crops, but the former as recommended by M'Intosh, is preferable, as it does not exclude the light. Early crops may also be protected by ridges or embankments of earth, 18 or 20 inches high, placed at the north side of the rows, both shelter and warmth are effected by this simple expedient. To forward an early crop it is necessary to pinch off the leading shoots when the peas are in blossom, which accelerates the setting and early maturity of the fruit.

For succession or main crops: make successive sowings every three or four weeks from the middle of February till the end of May, or with the view of having a constant succession of peas, sow another crop as soon as the one last sown shall be fairly above ground.

For late crops the frame and charlton may again be sown from the beginning of June to the first week in August; but Knight's marrow-fat is the best pea for late sowing, and may be set at intervals of ten days from the beginning to the end of June. "The ground is dug over in the usual way, and the spaces to be occupied by the rows of peas are well soaked with water. The mould upon each side is then collected, so as to form ridges seven or eight inches above the previous level of the ground; and these ridges are well watered. The seeds are now sown in single rows along the tops of the ridges, the plants grow vigorously, owing to the depth of soil and abundant moisture. If dry weather at any time sets in, water is supplied profusely once a week. In this way the plants continue green and vigorous, resisting mildew, and yielding fruit till subdued by frost."—*Hort. Trans.* II.

Subsequent culture.—When the plants have advanced in growth to the height of two or three inches, draw earth to the stems, and keep the ground entirely free from weeds. In frosty weather protect the rows by fern leaves, long litter, or branches of evergreens; but remove all coverings whenever the return of mild and open weather has effectually thawed the ground, but not before. In dry parching seasons some recommend watering. If this be undertaken it must be done effectually as in the case of Knight's pea, otherwise an occasional sprinkling does harm. The peas should be sticked when about eight inches high. The charltons and dwarf imperials will require branching-sticks of about four feet. Those for the latter growers should be six or seven feet; and for Knight's full ten feet high. On the sunny side of each row, i. e. east or south, place the sticks sufficiently close to keep the peas compact in the rows, without falling through. Half the number will suffice for the north and west sides, as they are not so much exposed to the sun's attractive influence. Peas as well as beans should not be set in plots of ground row behind row. The peas are injured if there be more than two rows, because they draw each other into long, straggling haum; and where the extent and situation of the garden will admit of the practice, advantage will be gained by always sowing in long single [illegible] for example that six rows, four feet asunder, be set in a plot of ground

be occupied, allowing for each three feet on each side of the two exterior rows, between the peas, and any other sort of crop that is standing, or to be planted. Thus ground will be lost, for when one, or at the utmost two rows only are planted, cabbages or any other short vegetables may be grown to advantage, at a very small distance from the peas, and even between the two rows, if required, whereas this could not be done without great risk of their being much drawn up, if planted between the six rows, particularly in wet summers.—*Domestic Gardener's Manual.*

Taking the crop.—Early crops are frequently gathered too soon, or when the peas are too young, for the sake of having them early at the table. In all cases they should be gathered while the peas are green and tender, yet they may be pretty plump. None should be left to grow old, as that would prevent the young pods filling properly, and shorten the duration of the crop.

To save seed.—Sow as many of each variety as may be wanted in separate pieces of ground, and let them stand till the pods assume a brownish colour, and the peas become hard, when they may be taken up, thrashed, cleaned, and preserved for future use.

USE.

The pea is extensively employed as a culinary vegetable, and as an ingredient in soups &c.

PEACH.

The Peach (*Amy'gdalus Pérsica*), Icosándria Monogy'nia, Linn.; and Rosáceæ, Juss.

The peach is one of our most esteemed fruit trees, two hundred and twenty-four varieties are enumerated in the Horticultural Society's Catalogue. M'Intosh describes the following as the best:—

1. White Nutmeg	20. Bellegrave	38. Vineuse
2. Red Nutmeg	21. Gallande	39. Late Purple
3. Early Avant	22. Malta	40. Late Peach or China
4. Small Mignonne	23. Bourdine	41. Teton de Venus
5. Early Anne	24. Royal George	42. Bloody Peach
6. Early Purple	25. Royal George, Grimwoods	43. Double Swalsh
7. Neal's Early Purple		44. Yellow Admirable
8. Superb Royal	26. Albrge Yellow	45. Braddick's American
9. Great Mignonne	27. Violette Hative	46. Late Admirable
10. White Magdalen	28. Late Violet	47. Bellis
11. Early Newington	29. Rosanna	48. Portugal
12. Belle Chevreuse	30. Royal Kensington	49. Buckingham Mignonne
13. Early Admirable	31. Rainbouillet	50. Golden
14. Early Violette	32. Nivette	51. Persique.
15. Red Magdalen	33. Noblesse	52. Old Newington
16. Moutauban	34. Spring Grove	53. Cherry Peach
17. Royal Charlotte	35. Acton Scott	54. Millet's Mignonne
18. Double Mountain	36. Incomparable	55. Catherine
19. Chancellor	37. Vanguard	56. Monstrous Pavie

For a small garden the following varieties are recommended—

1. Late Admirable	5. Gallande
2. Small Mignonne	6. Teton de Venus
3. Royal George	7. Red Magdalen
4. Noblesse	8. Ronald's Devonshire

Culture, &c.

SOIL.

A rich strong yellowish loam seems best adapted for the peach. When the soil is naturally rich no manure should be mixed with it, except it is of too close a texture, when a little well-decomposed vegetable manure and tanner's bark should be trenched up with it.

PROPAGATED.

By seed for the purpose of obtaining new varieties, but with the view of perpetuating any choice or approved sorts, the operation of *budding* is resorted to; for this purpose plum stocks are generally employed, but Knight (*Hort. Trans.* vol. ii.) objects to this practice because "the form and habit which a peach tree of any given variety is disposed to assume, is found to be very much influenced by the kind of stock upon which it has been budded; if upon a *plum* or *apricot* stock, its stem will increase in size considerably as its base approaches the stock, and it will be much disposed to emit many lateral shoots

always occur in trees whose stems taper considerably upwards; and, consequently such a tree will be more disposed to spread itself horizontally, than to ascend to the top of the wall, even when a single stem is suffered to stand perpendicularly upwards. When on the contrary, a *peach* is budded upon the stock of a cultivated variety of its own species, the stock and the budded stem remains very nearly of the same size at, as well as above and below the point of their junction. No obstacle is presented to the ascent or descent of the sap, which appears to ascend more abundantly to the summit of the tree. It also appears to flow more freely into the slender branches which have been the bearing wood of preceding years; and these consequently extend themselves very widely, compared with the bulk of the stock and large branches.

TREE.

1. Trees trained three or four years in the nursery, are preferred by many to maiden trees; in either case, however, they should be procured as soon as the leaf begins to fall, which generally occurs toward the end of October or the beginning of November.

2. In this country the peach is almost always trained against walls in the fan manner.

3. *Pruning.*—See Mr. Harrison's method, article Pruning.

USE.

1. The ripe fruit is held in high estimation at the dessert. A kind of brandy is made from this fruit in Maryland and Virginia; the manufacture of this liquid, and the feeding of pigs being the principal uses to which the peach is applied in those countries.

2. The leaves and kernels of the fruit steeped in brandy or whiskey, impart a flavor resembling that of noyeau.

PEAR.*

The Pear (*Py'rus Commúnis*), Isocándria Di-Pentagy'nia, Linn.; and Rosaceæ, Juss.

There are above six hundred varieties of this fruit enumerated in the Catalogue of the Horticultural Society. The following selection embraces the best:—

Name.	*Time of Duration.*	*Figure, Size, Colour, &c.*
The Little Musk	July and August	Conical, small, green
Green Chisel	....	Conical, small, greenish
Cranford	....	Pyramidal, yellow
Thorn	....	Long, conical, yellow
Orange Bergamot	August and Sept.	Middle size, green
Green Pear of Yair	....	Long, greenish yellow
D'Oyenne White	....	Large, roundish
Windsor	....	Large pyramidal, yellow and red
Jargonelle	....	Long conical, russet, yellow, and red
Belle Lucrative	Sept. and October	Roundish, green and russet
Hampden's Bergamot	....	Middle size, round, irregular, yellow
Summer Bonnechretien	....	Long, irregular, green and russet
Williams's Ditto	....	Long, middle, pale green russet
Gros Ransselet	....	Long, dark and reddish brown
Gunsell's Bergamot	October and Dec.	Long, dark green reddish brown
Autumn Bergamot	Oct. Nov. & Dec.	Round, greenish brown
Acton Town	....	Long, green and russet
Brown Beurré	....	Roundish, green, brown, and red
Golden ditto	....	Pyramidal, yellow, reddish brown
Spence's	....	Long, yellow and green
Ditton	....	Conical, large, yellowish green
Knevetts	....	Long, yellow and reddish brown
Maria Louise	Nov. and Dec.	Turbinate, pale green and russet
Napoleon	....	Turbinate, yellow and russet
Dutchess d'Angouléme	....	Irregular, russet green
Beurré d'Aremberg	Nov. and January	Turbinate, yellow and green
Diel Beurré	....	Pyramidal, yellow and russet
Bonne de'Molines	....	Long, pale yellow and russet
Present de'Molines	....	Conical, yellow

* Communicated by Mr. J. Cameron, Nursery Gardens, Uckfield.

Name.	*Time and Duration.*	*Figure, Size, and Duration, &c.*
Poire d'Ananas	November & Jan.	Long conical yellow
Swan's Egg		Middle, green and brown
Urbaniste		Pyramidal, greenish yellow
Josephine		Obtuse conical, yellowish green
Bishop's Thumb	Dec. and February	Long conical, green and brown
Crassanne		Obtuse conical, green
Ehaumontelle		Round, irregular, greenish yellow & brown
Passe Colmar		Pyramidal, yellowish green
Chapman's Pear		Ditto ditto
Epinaux		Obtuse conical, green
Uvidales		Long, irregular, green and brown
Catherine		Obtuse conical, greenish
Late Swan's Egg		Round, greenish
Colmar Beurre		Obtuse conical, green
Diable De Guerre, Baking	Dec. and May	Long, irregular, reddish brown
King Edward, ditto		Very large, russet brown
Bonnechretienne Winter, do.		Pyramidal, green and russet
D'Auch, ditto		Obtuse conical, green and russet
Cadillac, ditto		Round, irregular, green, brown, and red
Stoffels D'Hivre, Bergt.	Jan. and March	Roundish, green and brown
Belle Chevronelle		Obtuse conical, greenish brown

Culture, &c.

SOIL.

A soft rich loamy soil seems most congenial to the pear, it should be, however, of considerable depth; many of the varieties will succeed in other rich soils equally well.

PROPAGATED.

By budding or grafting upon stocks of their *own kind*, or upon quince and crab tree stocks, but the two latter kinds are now quite out of repute, as the fruit produced upon these stocks is neither so juicy or fine flavoured. Their own kind of stocks are esteemed for trees intended for dwarfs or for walls, because they do not allow the shoots to grow so fast and luxuriant. Some objections have been made which are of importance, for there are many *pears* which will not thrive upon them after a few years; the hard baking pears are rendered more insipid by being grafted on these stocks, while the softer and sweeter ones are rendered still more pleasant. It has been observed that no sort of pear will come to perfection upon a quince stock in a poor gravelly soil.

TREE.

1 Pear trees may be planted from the middle of October to the beginning of March, the ground being dug up and the trees put in when the weather is open.

2. Pruning and Training.

Wall and espalier trees should be trained and pruned as directed by Mr. Harrison, see pruning. *Standards* require but little pruning, keeping the heads moderately open, and removing any cross or irregular shoots is all the pruning that will be required.

USE.

1. The fruit is much esteemed, and generally preferred to the apple at the desert; it is also used for baking, preserves, &c.

2. The expressed juice, when fermented in the manner of cyder, constitutes the well-known beverage Perry.

3. The wood, which is light, smooth, and compact, is used by turners to make joiners' tools, and for picture frames to be dyed black. It is also frequently stained and substituted for ebony.

PLUM.

The Plum (*Prúnus Doméstica*), Icosándria Di-Pentag'ynia, Linn.; and Rosáceæ, Juss.

The plum is indigenous to this country, and in its wild state grows very extensively in our hedges and thickets. There are nearly three hundred varieties; M'Intosh describes the following:—

1. White Primordian
2. Morocco
3. Great Damask
4. Little Black Damask
5. Blue Perdrigon
6. Fotheringham
7. Orleans
8. White Perdrigon
9. Myrobalan
10. Orleans, Wilmot's
11. Rochecorbon
12. Green Gage
13. Green Gage, Isleworth
14. Little Queen Claudia
15. La Royale
16. Cheston
17. Drap d'or
18. Apricot Plum
19. Maitre Claude
20. La Mirabelle
21. St. Catherine
22. Large White Damask
23. Prunelle
24. Goliath
25. Damascene
26. Dauphine Gage
27. Blue Imperatrice
28. Coe's Golden Drop
29. Coe's Fine Late Red
30. Precoce de Tours
31. Red Magnum Bonum
32. White Magnum Bonum
33. Dapier Blue
34. Damask Violet
35. Wentworth
36. White Imperatrice
37. Blue Gage
38. Damson, Shopshire Damask
39. Bullace
40. Muscle
41. Wine Sour
42. Damson, Common
43. Damson, White
44. Golden Gage
45. Dowton Imperatrice

As a choice selection for a small garden, Mr. Nicol recommends the following varieties:—

1. Jaune Hâtive
2. Wilmot's Orleans
3. Green Gage
4. Red Magnum Bonum
5. White Magnum Bonum
6. Coe's Golden Drop
7. Goliath or Caledonian
8. Muscle
9. Damson
10. Wine Sour
11. White Bullace
12. Blue Imperatrice

Culture, &c.

SOIL.

Miller recommends a medium soil, neither too heavy and wet nor too light and dry. Abercrombie prefers the soil of any fertile meadow or orchard; or if to be made, to take one half of fresh loam, one fourth of sharp sand, one sixth of road stuff, and one twelfth of vegetable remains, decomposed dung, or animal matter. M'Phael says, that plums grow best in a brownish, mellow, moderately light loam, rather sandy than clayey of not less than three feet in depth. The aspect of the better sorts should be east or south east; other exposures may produce good plums of the less valuable kinds.

PROPAGATED.

By *Grafting* or *Budding* on the *muscle*, or any free-growing plum stock, raised from the stone of the fruit, or from suckers; the former method is considered the best for permanent plantations. Grafting is said to be commonly practised in America. The common sorts, as the bullace and damson are raised from suckers.

Grafting is performed in February and March, *budding* in July and August, either very low in the stock, that is within five or six inches from the ground for dwarf wall trees, or at from four to six feet high, for half and full standards, when the first shoots from graft or bud attain a year's growth, cut them down to a few eyes to produce lateral shoots for training; and in two years the trees may be finally planted in the border where they are to remain.

Plum trees produce their fruit on small natural spurs from the ends and all along the sides of the bearing shoots. In pruning, therefore, the branches should not be shortened; but all foreright and back shoots should be carefully removed, and the branches trained against the wall as regularly as possible. These trees may be trained as espaliers, or against a wall, in which case the directions for pruning and training, as recommended by Mr. Harrison, should be followed.—(See *Pruning*.)

Insects, Diseases, &c.—The gum and canker are the most common diseases, and, as in almost every other case, the acarus is the most noxious insect. As a remedy for the former, Abercrombie directs to head down; the insects are destroyed by the common means.

USE.

1. The finer varieties of this fruit are much esteemed for the dessert, and the others are extensively used in pies, tarts, conserves, &c.

2. The wood is employed for turning, cabinet work, and in making musical instruments.

POPLAR.

Poplar (*Pópulus*), Diœ'cia Octándria, Linn.; and Amentáceæ, Juss.

Of the genus populus there are many species, those most cultivated in this country are the following:—

1. The White Poplar, Abele, . . (*Populus Alba.*)
2. The Trembling Poplar, Aspen , (*Populus Tremula.*)
3. The Black Poplar, ... (*Populus Nigra.*)
4. The Lombardy Poplar, , , . . (*Populus Dilatata.*)

Culture, &c.

SOIL.

The White Poplar succeeds best in a moist clayey soil, but will thrive on a gravelly soil and in lofty situations. The Trembling Poplar does not succeed so well on stiff clayey soils, but will thrive in almost any other. The Black Poplar prefers a moist black soil, and the Lombardy Poplar a dry one, it will nevertheless grow remarkably well in a moist situation.

PROPAGATED.

By *seeds* and by *cuttings* ; the latter is the speediest method, and is therefore generally adopted, "The best cuttings of poplars," according to Mc'Intosh, "are taken from the wood of the preceding year, and when made, each cutting should be nine inches in length, and planted in nursery lines eighteen inches apart, and the cuttings about six inches distant from each other. When inserted in the ground, they should be put in deep enough to resist the drought ; and if only two inches of the top appear above ground, it will be found sufficient. In two years, or three at most, these cuttings will be fully grown to fit them for being finally planted out ; but if they are to remain the third year in the nursery, they ought to be taken up and replanted at a greater distance. The White Poplar often sends up naturally vast numbers of suckers from its roots, and such are sometimes used for young plants , cuttings are however preferable. Langley asserts that he has known great quantities produced by chips only, where the trees had been hewed after felling ; and one old author has proposed ploughing down these slips, with a view to produce an economical copice."

USE.

1. As a timber tree the white poplar is by far the most valuable of the British species ; its timber is of great value for all kind of wooden vessels, especially butcher's trays. It makes beautiful floors, and was employed for that purpose by the late Lord Sheffield, at his residence, Sheffield Place. It makes very good light carts, and beautiful turner's wood.

2. The wood of all the species is employed for similar purposes, but where the white poplar can be obtained it is always preferred.

POTATOE.

Potatoe (*Solánum Tuberósum*), Pentándria Digy'nia, Linn. ; and Solánæ, Juss.

Of all esculent roots, the Potato, says Mac. Innes, is undoubtedly the best entitled to our careful cultivation. Whether we regard it as the food of man or of beast, its excellent adaptation to almost every variety of palate and of constitution, induces us to recognize it as one of the very first boons of providence.

When we consider that, either as smoking in solitary importance on the labourer's humble board, or as taking its customary place among the viands of the great, the potatoe is universally welcome, it can excite no wonder, that it has always claimed the particular attention of agricultural experimentalists. The varieties of this nutritious vegetable, are more numerous than even the days of the year, differing in earliness, lateness, form, size, colour, and quality. The *names* given them by different cultivators are quite arbitrary or local, every district having its own peculiar or favourite varieties. Some of them degenerate, and others improve when removed from one district to another. The varieties in general cultivation, according to Mr. Loudon, "may be distinguished in regard to *precocity, tardity, form, size, color, and quality*.

1. *Precocity.*—The earliest varieties are :

1. Hog's Early Frame.—A small watery potato fit only for very early forcing.
2. Royal Dwarf.—A mealy potato, much grown at Perth.
3. Early Manchester.—Waxy and red.

4. Common Early Frame.—Waxy.
5. Fox's Yellow Seedling.—Similar, but rather larger; waxy.
6. American Early.—Much esteemed at Edinburgh.
7. Early Dwarf.—Waxy.
8. Early Ash-leaved.—Dry.
9. Early Champion.—Large.
10. Mc. Cree's Early.—Dry.

No blossoms are produced by any of the above sorts; they are roundish in form, small sized, white, and not of the best quality.

2. *Tardity.*—The latest sorts are
1. The round purple.
2. The oblong purple,
3. The speckled purple or tartan, commonly grown in mossy soils in Scotland.

3. *Form.*—The form of potatoes is either round, oblong, or kidney shaped. Of *the round* the most esteemed are
1. The champion, late and early varieties,
2. The oxnoble; very large, of a peculiar flavor,
3. Round red; middle sized, smooth,
4. Round rough red, or Lancashire.

The Oblong are
1. The red-nosed oval[1]; often confounded with the red kidney,
2. The oblong red, varied with white,
3. The oblong white,
4. The American red, long and not thick,
5. The Irish red, or pink; oblong and entirely red, with hollow eyes,
6. The bright red, blood red, or apple potatoe; ovate, with small full eyes, much grown in Cheshire and Lancashire, mealy and agreeably flavored.

The kidney shaped are
1. The common white kidney; of a peculiar flavor, esteemed by many,
2. The red kidney, reckoned somewhat more hardy.

In size, the early sorts are the least, and the oxnoble and late champions the largest.

In colour, the early sorts are in general white; the oblong sorts, red; and the latest sorts purple.

In quality, potatoes are either *watery,* as the very early sorts, *waxy,* as the American and Irish reds; or *mealy* as the ash-leaved early, the champion, the kidney, &c.

The following list is recommended by the principal London seedsmen, at the present time.

For forcing in frames, or for the first crop in the open garden.
1. Fox's seedling,
2. Early manly,
3. Early mule,
4. Broughton dwarf,

For general cultivation in the open garden, or field.
1. Early kidney, good flavor, and very early, keeps well,
2. Nonsuch; early, prolific,
3. Early shaw; good early sort for general use,

For main crops, arranged in the order of their ripening.
1. Early champion; very generally cultivated, prolific, and mealy.
2. Red-nose kidney,
3. Large kidney,
4. Bread fruit; originated about 1810, prolific, white, and mealy.
5. Lancashire pink eye, good,
6. Black skinned; mealy, white, and good.
7. Purple; very mealy, productive, and keeps well,
8. Red apple; mealy, keeps the longest of any.

Dr. Hunter, in his Georgical Essays, supposes the duration of a variety is fourteen years, and Mr. Knight concurs with him in opinion. There are some excellent varieties of party-colored potatoes in Scotland, which degenerate when removed from one district to another; and most of the Scotch and Irish varieties degenerate in England. The best mode, therefore, to order potatoes for seed is to give a general description of the size, color, form and quality wanted, and whether for an early or late crop.

Culture, &c. of the Field Potatoe.

Soil.

The best soil is a light, fresh, unmixed loam, so rich as to require but little manure; or if any, only that of vegetable compost, from decayed leaves, turf, or the like. A soil of a sandy nature is better adapted for potatoes than a heavy strong land, and those grown in the field are generally better flavored than those cultivated in the garden.

Propagation.

By seed, to obtain new varieties, or *by layers of the young shoots* to increase new or rare sorts

as quickly as possible; by *sprouts from the eyes*, employed in times of scarcity to save the tubers or roots for food, and *by cuttings or sets*, each containing one, two, or three eyes; this is the best mode, and the plan almost universally adopted both in the garden and the field.

1. *By seed.*—The apples, according to Abercrombie, are to be gathered when fully ripened in September and October, and the seeds taken out, and kept until spring. They are then to be sown, not too thickly, in small drills, and when the plants are two or three inches high they are to be thinned to the distance of five or six inches. At the end of October, the roots will supply small potatoes, which must be taken up; of these, a portion of the best are to be preserved for planting in the following spring. The succeeding summer's growth will determine the quality; and the approved varieties may be retained for future culture.

New varieties are obtained from seed in a much shorter time by adopting Macartney's method. "Sow the seed in a hot bed, about the middle of February, in lines six inches apart, a quarter of an inch deep, and very thin. When water is necessary, sprinkle it between the lines, but avoid wetting the plants, as that would injure them. A little air must be given before they are watered. As the plants rise, rich earth, carefully put between the lines, will add fresh vigour to them; but the tops of the plants must not be covered by these mouldings, which should be occasionally repeated until they are fit for transplanting. To prepare them for this, about the end of April they must be plentifully refreshed with air; and two hours before removing them they must be plentifully watered all over, and the glasses covered with bass mats to prevent the sun if shining at the time from scorching the plants; take each plant up carefully with a ball of earth attached to it, and plant them in trenches as you would celery, only with this difference, the distance from plant to plant in the lines must be eighteen inches; and if the sun should be shining out strong at the time of planting, a flower pot should be placed over each to prevent flagging; for with all your care in taking up, a good many of the fibres will be broken. After the plants have established themselves, remove the pots and earth up occasionally, as long as the space between them will admit of it. The produce of new kinds of potatoes raised in this manner is generally prodigious for twelve years afterwards. The best manure is yellow moss and rotten horse dung."

2. *By cuttings or layers of the stalks or by suckers.*—Cuttings of the young stalks, five or six inches in length, are to be set in the months of May and June, in fine light earth, or under a hand-glass. *Layers* of the stalks more than a foot long, may be made, either with or without cutting; cover the layers with earth three inches deep, and leave the extremities of the shoots exposed; they will emit roots at each joint, and produce full grown potatoes in autumn. *Suckers* or off-set sucker roots, may be removed in June, and will produce a crop the same year.

3. *By sprouts or shoots from the tubers.*—When early sorts cannot be readily procured, or when it is intended to save the tubers for use in the times of scarcity, the sprouts which are formed upon store potatoes in spring, and which are sometimes picked off and thrown away as useless, will yield a crop provided they are carefully planted in a loose well prepared soil. This crop likewise will be fitter for use and a little sooner ripe than one produced from cuttings or sections of the same tubers, in which the buds are not advanced. Such a crop, however, greatly depends on the fine tilth, good management, and good state of the ground.

4. *By cuttings or sets.*—It seems generally admitted, says Sinclair, that the cuttings should be made from large, but not from overgrown potatoes, and that it is not profitable to plant either small potatoes or small cuttings. A good set, part of a large potatoe, all other things equal will naturally produce a stronger and better plant, than part of a small potatoe, the crop being in general proportionate to the weight of the sets. They ought to weigh about two ounces each, and should not be such small ones as thrifty managers are so apt to employ. A large cutting gives nourishment to the plant when young, which promotes their future growth.

In Lancashire, they are convinced that the best plan is to cut off the front or nose end, and also the umbilcal or tail end of a large potatoe, and rejecting both, to take the middle part entire for planting. The common practice of cutting the potatoe down the middle from the tail is not to be recommended.

The advantage of large cuttings is satisfactorily proved by an experiment tried by Mr. Whyn Baker, in Ireland. He planted three sorts of cuttings; 1st. reasonably large—2nd very small; and 3rd, very large. The result was

1. The reasonably large, or moderate sized, produced	84lbs.	8oz.
2. The very small..............................	64lbs.	12oz.
Difference	19	7

This, upon an acre would make a very material difference. The produce upon the very large was little or nothing different, from the reasonably large or moderate sized.

Knight has found that for a late crop, small sets may be used, because the plants of the late varieties always acquire a considerable age before they begin to generate tubers; but

for an early crop, he recommends the largest tubers, having found that those uniformly afford strong plants, and readily recover if injured by frost; because if they are fed by a copious reservoir beneath the soil, they are speedily re-supplied by vigorous stems and foliage, when those first produced are destroyed by frost and other causes.

5. *The time for cutting the sets* should always be some days before they are intended for planting, in order that the wounds may have time to dry up, indeed, no harm will result if the cuttings are made several weeks, and even months, before hand, provided the sets are not too much exposed to drought, or they will lose great part of their natural moisture.

6. *Mode of managing the sets.*—This requires somewhat more attention than is generally paid to it, especially for early crops. It is the practice in Lancashire to put the sets as soon as they are cut on a room floor, two layers deep, and covered with saw-dust and chaff, to the depth of two inches, and in such a manner that a current of air can be introduced at pleasure. If desired to be very early, they are suffered to remain in this state from November till March, the greatest attention being paid to the introduction and exclusion of air, according to the state of the weather.

7. *Quantity of seed per acre.*—The quantity of seed varies from 15 to 30 bushels. It is generally considered that nothing can be more injudicious than close planting, therefore, if attention be paid in keeping the rows at proper distances from each other (not exceeding four feet) 20 bushels will be quite sufficient. Mr. Knight, however, thinks differently, his method will be detailed hereafter.

8. *Time of planting.*—The sort, the soil, and the manure all render variations necessary, as to the time of planting. Much, also, depends upon the season. When the soil is dry, as it always ought to be for an early crop, the sets may be planted in March, or earlier. Some experienced cultivators seldom plant before the beginning of May, as by a more early planting they conceive there would be some risk of injury by frost, the plant being remarkably tender in its vegetation.

Though instances have indeed been known of most abundant crops being produced, that were planted so late as the 8th of June, and in a few instances in the beginning of July, still this late planting cannot be recommended. From an enumeration of instances given by Sir J. Sinclair, it appears that the period of planting is in some degree regulated by the climate, being generally earlier in the southern than in the northern districts.

Notwithstanding the many variations in planting, it has been proved that no potatoes are either so mellow or mature as those which were planted in March or the first eight or ten days in April.

9. *Method of planting.*

1. *The lazy-bed method.*—“When this plan is adopted,” says Sinclair, “a bed is made from five to ten feet wide, on the surface of which the sets and dung are laid, to be covered by earth, from a trench about two or three feet wide, dug on each side of the bed. This practice is very general in Ireland, and is well adapted for damp soils and wet climates. It has also two other advantages: 1. That the potatoes have the entire benefit of the dung;—and, 2. That the earth above the cuttings is of a loose texture, which gives the roots full liberty to expand. That method must necessarily be adopted, by those who have not ploughs at command; but for general practice, where potatoes are raised on a great scale, drilling must always be preferred on account of the greater speed with which the operation can be carried on, and its superior cheapness; whence it may result, that a smaller crop may be more beneficial than a larger one gained by more operose and expensive cultivation.”

2. *Drilling.*—In the preparation of the soil for potatoes, it is necessary that the work be commenced as soon as the corn is out of the ground, as they require as much as any vegetable a deep and fine tilth. “Supposing it to be left foul after a crop of white grain, particularly oats, the stubble or etch is shallow ploughed, and the furrow inverted and left rough. In a month or six weeks, as the weather will permit, harrow down the ridges and tear the land about with ox harrows. Women and children being employed at the same time that the ground is being harrowed, in picking out the couch and other root weeds, which in the evening are usually burnt on the ground, and the ashes scattered early the next morning before the plough is set to work; then plough it across from sixteen to eighteen inches deep, if the ground will permit, laying the furrow on its side, and in this state it is suffered to remain until the first week, or fair weather in January, when it is well harrowed about, rolling it if necessary; picking, collecting, and burning such weeds as can be found; the land is then immediately ploughed up and down about twelve inches, and turned clean over, by which operation the soil will become ultimately mixed and well pulverized. About the end of February the furrows are harrowed down, and a coat of well fermented dung, or a greater proportion of any good mixen is laid on the ground, which being spread evenly is ploughed in about ten inches deep, about the middle of March, or somewhat later if the nights are very frosty; the ground is then harrowed smooth and even, and according to the sort of potatoe intended to be planted, drills or furrows are drawn with the plough at from two and a half to four feet, row from row, according to the size.”—(*Malcombe's Agric.*) The drills should be eight inches deep at the bottom of these drills; the sets are planted at from six to twelve inches asunder; a medium of nine or ten inches is to be preferred, although some plant as far apart as eighteen inches.

"It is not necessary to cover the drills with mould, until the entire sowing be completed. A light harrow, somewhat raised by being bushed, so as to prevent the narrow pins from reaching the dung (which it would otherwise drag out of the drills), drawn across the drills will effectually cover them, much better indeed than the usual method of doing it by the plough and then harrowing to level them. When the sets are covered with the plough, it leaves the ground uneven; the potatoes in consequence come up, *not in regular rows*, but sometimes on one and sometimes on the other side of the ridge formed by the plough, a great inconvenience in the horse-hoeing besides the expense. *Horse-hoeing* cannot be performed effectually unless the rows are even.

The horse-hoeing, by which is meant the throwing up mould out of the intervals to the plants in the drills, should be performed at least four times; each time going and returning in the same interval; that is, once from and three times to the plants. But the oftener they are horse-hoed the better, unless the planting is very late, then horse-hoeing keeps the potatoes too long in a growing state, and there is not then time for them to ripen fully. At the same time potatoes have been horse-hoed when in full blossom without receiving any injury."

3. *Dibbling.*

"By dibbling is meant employing an iron dibble, or a stick shod with iron about three feet in length, with the point of which holes are made for the reception of the seed.

At Avely, in Essex, they plough in the manure and dibble in the seed upon every furrow, ten inches apart and four deep. The produce only 201 bushels per acre.

Mr. Burke, of Suffolk, ploughed very deep, manuring with a few loads of short dung, and dibbled at ten inches. The produce 434 bushels. Planted the following year the champion sort. The crops were very great, proving that two crops of potatoes can be raised in succession with success.

Dr. Wilkinson, of Enfield, dibbled every furrow at the distance of eight inches, The crop 400 bushels.

The plan of dibbling potatoes is generally practised by the greatest planters perhaps in the kingdom (those of Essex), by whom London is chiefly supplied. Great attention is due to a mode preferred by such men, whose scale of practice is so great. Their crops, however, are not found (the vast advantages of London duly considered) to rise into such superiority as to allow conclusions favourable to that practice. It appears, indeed, from the following experiment, that drilling with the hoe is much preferable to dibbling. After both had been treated in the same manner in regard to manure, period of planting, &c.; when taken up there was only about one quarter more of produce from the drilled crop than from the dibble; but the potatoes were larger and had the advantage of being nearly a month earlier, by which the ground was at liberty sooner for another crop. The reason for this great difference seems to be, that in drilling with a hoe, the earth is left in a fine pulverized state, and the potatoe set, or cutting, is afterwards covered with similar earth; the roots consequently have very fine earth to strike into, and facility to expand. On the contrary, the hole made with a dibble or setting stick, which in general is either of iron or shod with it, glazes the soil around it, hardens the earth on the side into which the roots are to strike; and if much rain ensues soon afterwards, the hole will probably be filled with water.

Though these remarks are principally applicable to drilling *with the hoe*, yet they likewise may be extended to drilling with the plough, when it is well executed and the soil is light and easily cultivated.

4. *Planting by the hoe.*

"In the north Riding of Yorkshire, where they plant about twenty inches asunder, the dung is laid in furrows, the sets on the dung, and covered by drawing the mould upon them with hoes. When the plants appear they are earthed up by the plough.

At Sandy, in Bedfordshire, they plant by making holes with a hoe, and cover them by the next row of holes. They come up in about a foot square."

5. *Placing the sets above or under the dung.*

"It has been disputed whether the sets should be placed above or under the dung.

Mr. Whyn Baker, in Ireland, tried an experiment to ascertain that point with much attention, and the produce was:—

	lb.	*oz.*
Over the dung	105	4
Under the dung	84	3
The result....	21	1

which in an acre would make a most important difference.

It is considered to be injudicious to place the manure over the sets, for the roots run obliquely downward, or do not produce fruit; it is the lateral shoots that bear, when the manure is under the sets, the roots pierce into it and extract their food. A distinction, however, has been made; for it is a usual practice in Annandald, if the land be a light dry soil, to spread the dung *in the furrow above the plants*; but in a heavy soil, the potatoes are planted *above the dung*, with a view of giving the roots more space to expand.

In Cheshire also, *on shallow soiled land*, after two ploughings and harrowings, a furrow about four inches deep is turned, the sets are dropped in it eight or ten inches asunder, and the manure is then turned back upon the sets, the rows eighteen inches asunder. When the plants appear, the baulk is split, and the plants covered, weeded, and hoed." (*Sir John Sinclair on the Culture of the Potatoe.*)

In addition to the foregoing remarks we subjoin the following excellent paper on the cultivation of the potatoe, by T. A. Knight, Esq. recently published in the seventh volume of the Transactions of the Horticultural Society. Its importance is so great as to require no apology for its appearance in this place.

"Whatever may have been the amount of the advantages or injury which the British Empire has sustained by the very widely extended culture of the potatoe, it is obvious that under present existing circumstances, it must continue to be very extensively cultivated; for, though it is a calamity to have a numerous population who are compelled by poverty to live chiefly upon potatoes, it would certainly be a much greater calamity to have the same population without their having potatoes to eat.

Under this view of the subject, I have been led to endeavour to ascertain by a course of experiments, the mode of culture by which the largest and most regular produce of potatoes, and of the best quality, may be obtained from the least extent and value of ground, and having succeeded best by deviating rather widely from the ordinary rules of culture, I send the following account of the results of my experiments. These were made upon different varieties of potatoes; but as the results were in all cases nearly the same, I think I shall most readily cause the practice I recommend, to be understood by describing minutely the treatment of a single variety only, which I received from the Horticultural Society under the name of Lankman's potatoe.

The soil in which I proposed to plant being very shallow and lying upon a rock, I collected it with a plough into high ridges of four feet wide, to give it an artificial depth. A deep furrow was then made along the centre and highest part of each ridge, and in the bottom of this, whole potatoes, the lightest of which did not weigh less than four ounces, were deposited at only six inches distance from the centre of one to the centre of another. Manure, in the ordinary quantity, was then introduced, and mould was added, sufficient to cover the potatoes rather more deeply than is generally done.

The stems of potatoes, as of other plants, rise perpendicularly under the influence of their unerring guide, gravitation, so long as they continue to be concealed beneath the soil, but as soon as they rise above it, they are, to a considerable extent, under the control of another agent, light. Each inclines in whatever direction it receives the greatest quantity of that fluid, and consequently each avoids and appears to shun the shade of every contiguous plant. The old tubers being large, and under the mode of culture recommended, rather deeply buried in the ground, the young plants in the early part of the summer never suffer from want of moisture, and being abundantly nourished, they soon extend themselves in every direction, till they meet like those of the contiguous rows, which they do not overshadow on account of the width of the intervals.

The stems being abundantly fed, owing to the size of the old tubers, rise from the ground with great strength and luxuriance, support well their foliage, and a larger breadth of this, is thus, I think, exposed to the light during the whole season, than under any other mode of culture which I have seen; and as the plants acquire a very large size early in the summer, the tubers of even very late varieties, arrive at a state of perfect maturity early in the autumn.

Having found my crops of potatoes to be in the last three years, during which alone I have accurately adopted the mode of culture above described, much greater than they had ever previously been, as well as of excellent quality, I was led to ascertain the amount in weight which an acre of ground, such as I have described, the soil of which was naturally poor and shallow, would produce. A colony of rabbits had, however, in the last year, done a good deal of damage, and pheasants had eaten many of the tubers which the rabbits had exposed to view; but the remaining produce per acre exceeded five hundred and thirty-nine bushels of eighty-two pounds each, two pounds being allowed in every bushel, on account of a very small quantity of earth which adhered to them.

The preceding experiments were made with a large and productive variety of potatoe only; but I am much inclined to think that I have raised, and shall raise in the present year, 1828 nearly as large a produce per acre of a very well-known small early variety, the ash-leaved kidney potatoe. Of this variety I selected in the present spring, the largest tubers which I could cause to be produced in the last year, and I have planted them nearly in contact with each other in the rows, and with intervals, on account of the shortness of their stems, of only two feet between the rows. The plants at present display an unusual degree of strength and vigour of growth, arising from the very large size (for that variety) of the planted tubers; and since as a large breadth of foliage is exposed to the light by the small, as could be exposed by a large variety; and as I have always found the amount of the produce, under any given external circumstance, to be regulated by the extent of foliage which was exposed to light, I think it probable that I shall obtain as large, or very nearly as large, a crop from the small variety in the present year, as I obtained from the large variety in the last. I have uniformly found, that to obtain crops of potatoes of great

weight and excellence, the period of planting should never be later than the beginning of March.

POSTSCRIPT.

March 23, 1829. Somewhat contrary to my expectations, the produce of the small early potatoe exceeded very considerably that of the large one above mentioned, being per acre six hundred and sixty-five bushels of eighty-two pounds. It is usually calculated by farmers that eighty pounds of potatoes, though eaten raw, after they have begun to germinate, will afford two pounds of pork; and I doubt much if the haulm, and the whole of the manure made by the hogs, were restored to the ground, whether it would be in any degree impoverished. I am not satisfied that it would not be enriched,—an important subject for consideration in a country of which the produce is at present unequal to support its inhabitants, and which produce is, I confidently believe and fear, growing gradually less, whilst the number of its inhabitants is rapidly increasing."

After Culture.

1. The after-culture consists in harrowing, hoeing, cleansing, and earthing up. As soon as the plants are four or five inches above ground, the ridges should be flat hoed interiorly, by doing which the earth will be made to fall loosely about the roots, and by pulverizing and loosening the soil it will operate as a gentle earthing. In about three weeks they may be treated in the same way, throwing up a greater quantity of earth than at the last operation. At the third earthing up a small plough should be substituted for the hoe; indeed, in Scotland and in other districts where the potatoe is extensively cultivated by the farmer as food for cattle as well as man, the plough is universally used. The operation of earthing up must be repeated either by the plough or hoe, as often as it can be conveniently done without injury to the stems. In some moist and warm seasons, the plants will be found to grow so fast, that it will be impossible to get through with the last earthing up by plough or horse hoe, without material injury to the stems; in such cases, therefore, the hand hoe, or even the spade, may be used with advantage.

"I am so thoroughly satisfied," says Mr. Malcombe, "with the necessity of repeatedly earthing up potatoes, that I scarcely remember to have seen a good crop where it was omitted; for if the season proves very dry, the landing up the stems keeps the roots moist and prevents the extreme heat of the summer's sun, or the drying winds and frosts which sometimes prevail in June, from injuring them, enabling the young fibres to strike into the fresh soil, and the bulb to swell and expand, and to acquire its full compliment of farinaceous substance. In a wet season the bulbs are not so watery, nor so much injured by worms when landed up, as when the whole surface of the ground lies flat. because the landing up throws the water from the roots into the middle between the rows, which are in general below the bulbs, where it soaks away without saturating them, and consequently they will be more farinaceous and wholesome."

2. *Pinching off the blossoms.*

This operation may, at first view, appear too minute a matter for the consideration of the farmer who cultivates on a large scale; but when it is recollected that the seed is that part of a plant to which the ultimate effects of nature are always directed, it must be allowed that the greatest part of the nourishment must be devoted to them in order to bring them to maturity. By the experiments of Mr. Knight, he has found that in ordinary cases of field culture, more than one ton per acre of additional tubers will be produced by pinching off the blossoms. A woman or boy will crop the blossoms from an acre of land in a day, or where the crops are not over luxuriant in much less time.

3. *Taking the crop.*

Potatoes are either dug up by the hand or ploughed up by horses. On a small scale it is generally performed with the spud, or three-pronged fork; but in extensive farm management and in the row culture, by means of the common plough. Taking up the crop by means of hand labour is both tedious and expensive, being cold and disagreeable especially in wet seasons. If the plough be used the muzzle must be fixed on the right side of the end of the beam, so that the horse may go up the intervals between the drills, and plough up the very centre of the drills, with the share under the growing potatoes, by which the drill is split in the middle, a furrow thrown each way, and the principal part of the potatoes laid bare. This operation should be followed by women or children to gather the potatoes into baskets, and after these cleaners, with their pronged forks to turn up what may yet remain, and others to collect the haulm and weeds into heaps.

4. *Preserving the crop.*

There are several modes of preserving potatoes through the winter, as in houses, vaults, or cellars, or in heaps or ridges. The general practice in Sussex is either to build a kind of shed of clay and straw, the walls six feet thick, over a hole of the depth of four or five feet, in which they put the crop, or by placing the potatoes in heaps, covering them thickly with dry straw, forming round it a deep trench, and covering them over with the excavated earth to a considerable thickness, each layer being beat firm and close with the spade. In very severe frosts the whole is covered with muck. They are sometimes preserved in cellars, pi's, &c.; but whatever plan be adopted, it is necessary that the tubers be perfectly dry, otherwise some are almost certain to rot, and a few

rotten ones are sure to contaminate the whole heap. It is a matter of the highest importance to preserve this root without spoiling during the whole year; for this purpose, there is no plan so well as that of covering them up with straw and earth in some shape or form. Donaldson has frequently seen potatoes kept in excellent condition till June, by spreading them on a dry floor early in the spring, and occasionally brushing off the eyes if they have a tendency to sprout. By keeping them in a warm place they are almost sure to sprout.

Culture, &c. of Garden Potatoes.

The propagation and general management of the potatoe, whether raised in the garden or in the field, are, in every respect so similar, that separate details with respect to their cultivation seems altogether unnecessary; to obtain *early crops*, however, in the open garden, various plans have been suggested,—the following are recommended as the best for that purpose:—

To obtain early potatoes.—Plant ash-leaved kidneys whole, in the beginning or middle of October, on a south border, in drills nine inches deep, eight inches apart, and fourteen inches between the rows, and let them be well covered with muck. Towards the end of March, as soon as the tops appear above the surface, let the ground be well forked between the rows, and if the weather is severe the tender leaves should be protected by inserting evergreen branches on each side of the rows; in a fortnight or three weeks move the surface again but do not earth up the plants. By this method potatoes may be obtained full a fortnight earlier than if the planting is delayed until February, and if proper care is taken in the process of planting no danger need be apprehended from the frosts. By the Lancashire mode of raising early potatoes, which seems particularly suitable for the colder parts of Britain, they are generally ready about the beginning of May. Mr. Saul, of Lancaster, says, "put the potatoes in a room, or other convenient warm place, in January, about the second of February, cover them with a woollen cloth for about four weeks, then take it off, and by so doing you will make the sprouts much stronger, towards the latter end of March set them, covering the sprouts two inches deep. If the sprouts be about two inches long when set, the potatoes will be ready in seven or eight weeks afterwards."—(*Gard. Mag.* vol. ii.) The sets of the extreme end of the potatoes are found to grow faster, and ripen about a fortnight earlier, than those at the root end; in Lancashire, therefore, the sets from the two ends are separated, and if planted at the same time, form an earlier and successive crop. (*Gard. Mag* vol. i.) In Denbighshire, the potatoes intended for seed the following year are taken up before they are ripe, just when the outer skin peels off, and before the stem or stalk begins to wither; they are then laid upon a gravel walk fully exposed to the sun, for a month or six weeks, when they become quite green and soft, as if roasted, and often much shrivelled; they are then put away and protected as other potatoes are. In February they are examined, when every eye is generally found full of long sprouts fit to be planted. Only two sets are made of each potatoe, the eye or top part, and the root or bottom part. They are separated as in Lancashire, and, when planted in the common ground, the eye or top sets are earlier by a fortnight than the others. They are generally fit to gather before the middle of May.—(*Gard. Mag.* vol. ii.)

For successive crops, to produce in June or early in July, plantings should be made in February or early in March. For small early sorts let the drills be from fifteen to eighteen inches asunder. Small whole potatoes, or sets previously prepared, must next be planted, six, eight, or ten inches apart in the rows.

For main crops, planting may be made from the middle of March to the middle of April, or even later, but it is not advisable to defer the planting much later in the season if it can be avoided. The drills are casually made from twenty inches to two or three feet apart, according to the poverty or richness of the soil. Should the land require manuring at the time of sowing, well-rotted manure should be employed, placing it at the bottom of the drills *beneath* the sets; malt dust, however, when it can be obtained, should always be preferred, as it prevents most effectually the ravages of the wire-worm, and preserves the skin of the potatoe of a delicate colour.

After-culture.

The early planted potatoes will rise freely in May, and when they are two or three inches above ground, let them be well hoed in dry days, and in the sunshine, that the weeds may be effectually destroyed. When the plants are about six inches high, draw earth to the stems, it will strengthen them and tend to increase the produce. Continue to keep the ground free from weeds, and finally ridge up the stems to the height of at least six inches on each side; little more will be required, and a similar treatment will be suitable to the late crops. The directions given for the taking and preserving of field potatoes are equally applicable to those cultivated in the garden.

Use.

Dr. Paris observes that the use of potatoes was violently opposed for nearly two centuries, and particularly in France, till at length Louis XV. wore a bunch of the blossoms in the midst of his court, when, for the first time, the people obsequiously acknowledged the utility of the root. After all this opposition, potatoes are found to produce, *cottony flax*, from the stalk, *sugar and spirit* from the root, *potass* by [illegible]

bustion; *vinegar*, from the apples; *soap*, or a substitute in bleaching, from the tubercles: finally, when dressed for the table, the most farinaceous and economical of all vegetable food. The question of the salubrity of the potatoe has been agitated with great partiality. By some the root is said to possess poisonous qualities, particularly after hot and dry summers, and when used as the chief article of food, to be a proximate cause of typhus fever. By others it is exalted as the finest, the most nutritive of vegetables. The truth is, that millions employ the potatoe liberally, and remain strong and healthy; but with some it proves flatulent, and difficult of digestion. In an economical point of view, it can never be recommended as a *substitute* for bread. and they reason unwisely who compare potatoes with wheat or other farinaceous substances. The fact is, wheat and potatoes are *essentially different* in their chemical constitution as the following analysis clearly demonstrates.

From the analysis of Einhoff, it appears that 7680 parts of potatoe afford:

	Parts.
Starch - - - - - -	1153
Fibrous matter analagous to starch -	540
Albumen - - - - -	107
Mucilage, in a state of saturated solution	312
	2112

The analysis of Davy has proved, that out of four specimens of wheat that which contained the *smallest proportion* of nutritive matter, yielded, of *starch* 70 parts, and of *gluten*, 24 parts—94 parts out of 100. Thus it appears that potatoes contain *no flour*, in the proper acceptation of the term: that powdery substance which they deposit is, *starch or amylum*, and it is wholly destitute of *gluten*—a substance indispensibly required for the production of the mass of dough, which after being duly fermented and baked, becomes bread. The amylum of the potatoe will combine with wheat or other flour, in the proportion of one eight to one fourth of flour, and will tend to whiten the bread, It will do more, for if, as is sometimes the case, the fermentation be imperfect, the batch of bread, which if made of flour only, would be "sad," and doughey, will be improved in its texture, and instead of being brown and tough, will be whitish, "short," and in proportion more palatable and easy of digestion. But potatoe starch alone, can never be made into bread, and therefore cannot become a substitute for flour. However it might be brought into a very useful adjunct; for if a large stock of potatoes remain unconsumed at the end of a season, as was the case in 1828, when hundreds of sacks, the surplus of the vast yield of 1827, were thrown away or given to pigs, being unsaleable at a shilling per sack; if at such a time of plenty some machines were employed to manufacture potatoe starch from the surplus stock, a valuable supply of very nutritious food would be prepared, which in the event of a bad harvest, might in part supply the place of wheaten flour.

Result of Two Experiments.

1. From 8 lbs of unpeeled potatoes:

	lbs.	oz.
Amylum or starch - -	1	6
Pulp pressed by hand - -	1	11
Loss in water or soluble matter -	4	15

2. From 8lbs. of peeled potatoes:

	lbs.	oz.
Amylum or starch - -	1	3
Peelings weighed - -	1	5
Pulp, pressed - - -	1	14
Loss in water, &c. - -	3	10

Thus it appears that the yield of starch is decreased by peeling, and therefore the potatoes should be merely cleansed by brushing under water, and by repeated washings.

2. Potatoes appear to be particularly useful in the manufacture of bread, by promoting the fermentation of the dough. To effect this, they may be introduced among the flour after being boiled to a mealy state; but the best method is to employ them as a ferment. For two pecks of flour, take from two to four pounds of mealy potatoes—the former quantity will be enough if preferred; boil them till they will pulp readily, through a colander, and when lukewarm, add to the pulp one fourth of the barm (yeast), which would have been used without potatoes. The pulp, if too dry, should be brought to the consistence of thin paste, by the addition of milk-warm water, and a table spoonful of moist sugar or honey, will promote the process: cover the mixture with a plate or cloth, and let it stand near the fire till a strong, frothy head arise. This potatoe yeast should be blended with about a twelfth or sixteenth part of the flour, to work as "sponge," in the centre of the mass, in order to secure the fermentation of the whole. Some bakers have been known to have given two guineas for a receipt to prepare potatoe yeast, and it is considered so effectual in promoting fermentation, that the misfortune of a "sad" (heavy) batch, is seldom incurred, when it is used. It is said by some, who ought to know the fact, that bread, worked with a due proportion of potatoes, is at least two shades whiter in color, and of much better texture than when it is wrought with the yeast of beer only; to

which it may be added, that the bitter taste frequently communicated by such yeast, is wholly obviated, and the ferment can be employed liberally, with almost a certainty of a corresponding good result.—*Domestic Gardeners' Manual.*

Sir J. Sinclair prefers the farina or starch of the potatoe in the making of bread, and proposes the following method for this purpose:

RECEIPT FOR MAKING "FARINA BREAD."

For any quantity of wheat flour to be used, take for one pound of the flour about one ounce of the farina of potatoes. Mix the farina in a large bowl, or tub, or cask, according to the quantity to be used, with just as much cold water as will thoroughly moisten it. Then gradually pour into it *boiling water,* stirring it the whole time, until it forms itself into a jelly. It would make the jelly freer and more easily mixed in the dough if a small quantity of flour were gradually mingled with the jelly, when boiling. In this state the jelly may remain until cooled down to the heat, at which time the water is usually taken to set the sponge. Then mix the jelly in the sponge with the flour and yeast, and treat it afterwards in the usual way of making bread. It will produce a fine fermentation, and a light, dry, and sweet loaf. The addition of so glutinous a substance as jelly, is a very great improvement to the flour of new wheat; and with this addition, such flour, even if injured by an unfavorable harvest, can sooner be employed in baking bread, than could otherwise be attempted. Any flower from old wheat will not be required, or at least in a much less quantity. Bread, with a mixture of potatoe jelly, has peculiar advantages. It keeps longer moist; it is lighter on the stomach; it toasts much better, and makes much better bread-puddings. When the bread is baked with the farina undissolved, the mixture cannot be so completely effected, the bread is heavier and less agreeable to the taste.

RECEIPT FOR POTATOE BREAD.

Pare the potatoes, slice them thin, wash them thoroughly, and put them into a can, pouring boiling water over them, to take out the black liquor or acid. After they have remained in that state for an hour, pour off the water, and put them on the fire until they are brought into a mass or solid body. Then add the yeast, and a handful of flour, switching the whole together. Then lay it into a sponge, make it into a dough, and put it into the oven for baking. Not only light and good bread, but rolls, pastry, &c. may be made from potatoes thus prepared.

But bread, with boiled or steamed potatoes, can only be good for about four or five months in the year, while they continue in a wholesome state; whereas made with the jelly of the farina, it can be had in equal perfection at all seasons of the year.

An excellent pudding may be made with the potatoe fibre thus: Boil a pound of it in a quart of skim-milk, for half an hour, then add two ounces of suet, minced small, two or three eggs, and sweeten it as a rice pudding; then bake it, or place it to brown before the fire.

3. Perhaps the most important application of potatoes ever discovered, is to be found in an interesting article recently published in the Quarterly Journal of Agriculture, by J. Mc. Innes, Esq. "On an improved use of Potatoes,"—"During a residence of 30 years in the West Indies, I often thought" says "Mr. Mc. Innes" of the immense advantages that would accrue to our colonies, if rendered independent of America, for negro food. It occurred to me, that by our manufacturing the Cassada root into tapioca, similar to what is done in the Brazils, an adequate substitute might be procured for rice. Impelled by this idea, I embraced a few leisure hours for making the experiments, and I found it completely answered my anticipations. No other emotion was thence excited but surprise, on reflecting that such a profitable use of the cassada had been so long and so unaccountably neglected. This tuberous root as is well known to those who frequent the tropics, is fibrous and juicy, and in its shape and properties not unlike the carrot or parsnep. In converting the Cassada into Tapioca, it must be nicely washed, grated, and fired. Now as similar causes necessarily produce similar effects, it repeatedly, and forcibly suggested itself to my mind, while inspecting this process, that the potatoe might be treated in the same manner, and with equal consequences. On my return to Europe, I embraced an early opportunity of putting the idea into practice. The mode in which it was so done, together with its issue, I now proceed to describe.

As in the case of the cassada, the potatoes selected for the experiment are thoroughly washed, after which they are grated in a machine constructed for the purpose. The parts thus reduced or grated, fall into a vessel placed underneath. From this vessel they are removed, and strained into a tub. On the juice being well expressed for the first time, the fibres are set apart, and cold clean water is thrown over them. These fibres are again put through the same strainer, till the whole of the substance is again collected, when they are finally cast aside. On this being done, the contents of the tub, now in a state of mucilage or starch, are allowed to settle. A reasonable interval being suffered to elapse, the old water is poured gently off, and fresh water supplied. After this process of fining and washing, the blanched matter is worked through a smaller strainer. As formerly, the offals are separated. The starch becomes now much whiter; still, fresh water is abundantly dashed over it. When by frequent ablution, the surface of this vegetable mass is rendered quite smooth and clean, it is filtrated a third and last time. The strainer now used, is of very fine texture, so that no improper or accidental admixture may interfere. As soon as the starch thus purified

has firmly subsided, it is spread on a board and exposed to the open air. The damp speedily evaporates, on which it is, as a security for cleanliness put through a sieve.

A large circular pan is now procured, and set upon the fire. The farina is gradually put into the pan, till what is conceived to be sufficient for one cooking be supplied. As the natural tendency of the farina, in a warm state, is to adhere to the pan, great care is requisite in constantly turning and stirring it. This is effectually done, with a broad, flat piece of wood, having a long handle, to prevent inconveniency from heat. I find that a temperature of 150 deg. Fahrenheit, suits best for perfecting the tapioca. When the farina becomes quite hard, dry, and gritty, it is then ready, and may be taken off the fire.

To put the comparative difference between the potatoe flour thus reduced to tapioca, and the West Indian or Brazilian tapioca manufactured from cassada, to the test, I ordered a pudding to be made of each. The same ingredients, viz, sugar, eggs, cinnamon, and cream, were scrupulously proportioned to one as to the other, and when ready, and separately presented for eating, no perceptible distinction could be traced. In appearance, taste, and flavor, they were in every respect the same. If a sensitive palate were to pronounce a difference, the decision would perhaps be favorable to the home tapioca, as being rather more delicate than the other. This might however be accounted for from its discernible freshness. The Brazilian or foreign tapioca, as is generally known, is greatly recommended by medical men, as a most nutritious, strengthening food. Its value in this country is ascertainable by the high price asked and given for it. Of its efficacy in stomachic disorders, and other physical infirmities, I myself, during my long residence abroad, had ample occasion to witness. My satisfaction then, on thus finding from experiment and comparison, that the potatoe was convertible into as valuable a form of diet as the cassada, gave rise to the most pleasing anticipations.

Were the manufacture of potatoes into tapioca to be more generally adopted, it would doubtless, too, lessen our present dependance on the importation of foreign corn. In years of agricultural scarcity, we could always betake ourselves to a native resource. The skilful appropriation of potatoes to purposes of domestic consumption would meliorate our rural economy, since a quarter of a pound of tapioca made into puddings or panado by soaking, is sufficient to yield a substantial and delicate repast for three or four persons. It is a species of food also, that keeps uninjured for years. It is portable, made ready with ease and expedition, and not eaten by vermin, nor are the offals themselves lost. The fibres of the potatoe rejected during the tapioca preparation, are, when sprinkled over with a little oatmeal, greedily devoured by cattle, pigs, and other live stock. This is of course a matter of some consequence to the profit side of such a manufacture."

4. The process for obtaining farina or starch from potatoes has already been described, but one or two instances, pointing out its utility as an article of food, as suggested by Sir J. Sinclair, must not be omitted.

The farina of the potatoe is easily convertible into jelly, in the same manner as arrowroot, by gradually pouring into it some boiling water, and stirring the mixture about; and in this shape it may be taken, with a little milk and pounded sugar, for breakfast or supper, with the addition, perhaps of some toasted bread or biscuit, to those who are in health. Invalids however, have found it useful to live almost entirely on this jelly. Farina jelly, however, being rich and glutinous by itself, it is a great improvement when it is boiling, gradually to mix with it one or two table spoonfuls of wheaten flour, ground rice, (this mixture is the most pleasing to the eye), oatmeal, barley-meal, or the flour of Indian corn, stirring it all the time, that the two substances may be thoroughly incorporated. *This makes a pleasant, nourishing, substantial diet*, which cannot be too much recommended, particularly for those who are recovering from illness. It may be taken either with or without milk.

The value of the potatoe as a culinary vegetable is admitted on all hands, but as its utility very much depends upon the state in which it is brought to the table, the following "Hints for boiling Potatoes," by Sir J. Sinclair, Bart. will, it is presumed, be found neither irrelevant, nor out of place.

"*To have potatoes boiled in the greatest perfection*, it will be proper to attend to the following directions: The potatoes should be sorted, so as to have the large and small boiled separately. After being thoroughly washed by a birch broom, in a pail of water, or otherwise, they ought to be lightly peeled. and then put into a pot, *with less water* than is sufficient to *cover them*, as the potatoes themselves will produce a considerable addition of fluid before they begin to boil. Sea water is sometimes used, but it makes them tough. A little salt however thrown into the water, is of great use, rendering them freer. If the potatoes, are tolerably large, it will be necessary, as soon as they begin to boil, to pour in some cold water, and occasionally to repeat it, till by trial, the potatoes shall be found to be boiled quite to the heart; they will otherwise crack and burst to pieces on the outside, whilst the inside will be in a crude state, and consequently very unpalatable. This is particularly necessary if the potatoes are large. When thoroughly boiled, the water should be poured out of the pot, for they become quite insipid if they remain long in the water after being boiled; but when the water is got rid of, the pot, with the potatoes in it, should be put again upon the fire, that they may be thoroughly cleared of all moisture, and the cover should be taken off that the steam may evaporate. If any moisture should

remain, they may be put on tin plates before the fire, that they may be made thoroughly dry, and the top of the heap will be slightly browned, which has a pleasing appearance.

Some recommend boiling them with the skin on, but the black and unwholesome liquor with which potatoes are naturally impregnated, resides much in the skin, and it is much better to get rid of that portion of it, before the boiling commences. The potatoes, if they are of a good mealy quality, will have a beautiful, white color, when brought to the table.

In regard to steaming potatoes, it is not reckoned so wholesome, for the injurious liquor in the potatoe already alluded to, cannot be so effectually extracted from it by steaming, as by boiling them in water. The water in which potatoes are boiled, cannot be safely given to stock. When steamed, that injurious substance is retained in the potatoes.

6. For cattle and swine, the potatoe, under proper management, is a very important article of food. Its application for these purposes, is noticed under the articles Neat Cattle and Swine.

POULTRY.

Under this head are arranged the various domesticated birds which form part of the farmer's attention, viz:—

1. Fowls.
2. Turkeys.
3. Geese.
4. Ducks.
5. Pigeons.

FOWLS.

The following varieties are generally bred in England:—

1. Game.
2. Dunghill, or White breed.
3. Poland or Black breed.
4. Dorking: distinguished by having five claws.
4. Shagbag,
6. Bantham.
7. Chitagong or Malay.
8. Spanish.
9. Pea and Guinea Fowl.

Situation and Yard Management.

1. Some situations are better adapted for breeding and rearing chickens than others; dry sandy soils are particularly favourable;—damp situations occasion disease.

2. Where the erection of fowl houses is necessary, a good, airy situation, will be found advantageous. The construction of these houses is various; all should have the facility of being cleansed, for cleanliness is the great art of keeping chickens,—disease is generated by filth. To prevent vermin from making inroads, the walls should be frequently white-washed, and where they have made inroads, the house should be cleansed by burning frankincense or other similar substances. Ducks and geese should not be permitted to rest under the roosting place of hens, as these cause injurious smells, and stench the fowls.

3. When the fowls are kept within a yard, plots of grass or clover may be planted here and there, and also a few heaps of land sand, land gravel, or ashes should then be placed, that the fowls may roll themselves and cleanse their feathers from vermin.

4. Various roosting houses should be built for the different sorts of poultry, and separate nests provided in situations where they can be confined and kept from the rest, as without this precaution, the same nest will have two or three upon it, from which much injury may be sustained.

5. The floors of the roost houses should be sanded, and in warm weather, the doors thrown open to give access to fresh air.

Choice of Fowls.

It appears that those fowls which are the best layers are generally the worst sitters, from which hypothesis it will be evident that considerable benefit may result from keeping good sitters, in conjunction with good layers, the one laying the eggs, while the others are occupied in breeding and rearing the young. The black fowls partake of the nature of the game breed, and are therefore not remarkable for assiduous attention to sitting, frequently laying one hundred eggs, before showing the slightest symptoms of incubation. The white leg dorking, invariably proves a good sitter, seldom if ever laying more than fifteen eggs before she attends to sitting. The other white leg breeds are of various dispositions.

Laying.

1. Young hens or pullets begin to lay when they are about nine or twelve months old; this depends much on the nature of the food upon which they have been kept. The laying season generally commences about January, or early in the following month, provided the fowls are in good condition, and have been kept occasionally on barley, buck wheat with a little hemp seed, or other nourishing food. To promote hens laying, they should not be fed too high or too low.

2. The hens will lay without having connection with a cock, yet it is advantageous to keep one, as they will thrive better, and produce superior eggs. Instances have been known where hens have been separated from a cock for a month, and the eggs produced during that interval have proved fruitful. A strong, bold, active, savage cock is to be preferred. Some cocks will give a preference to particular hens, and to others show a strong dislike; these obnoxious hens should be removed, and others substituted.

3. Pullets commence laying before sitting hens, because they do not moult the first year; setting hens moult generally, during the months of October and November, till after the third year, which when passed, instead of moulting annually, they moult every succeeding year.

3. Hens, both for sitting and laying eggs, are best between the ages of two and four years, after which period they lay less frequently, and sometimes produce unshelled eggs.

Sitting.

1. The usual time hens commence sitting, is about the latter end of February, or as the warm weather advances, previous to which time the nests should be looked to, cleansed and supplied with short straw. The reason short cut straw is preferred, is because there is a danger when long, of the hen getting her legs entangled in leaving her nest, and dragging with her some of the eggs.

2. In selecting the eggs to be set upon, care should be taken that they be not more than a month old, and of equal sizes, free from flaw or double yolks, and not exceeding the number of fifteen.

3. The time of sitting before hatching, is twenty-one days. The hen, sometimes after she has commenced this duty, will lay two or three eggs, which should be removed while absent in feeding, or the hatching will be prolonged two or three days, occasioning much inconvenience. The time when the hen is anxious to sit may be known by her chuckling.

4. In cases of accident, of any of the eggs being broken, it will be advisable to clear them away, and wash the others in blood-warm water, and also the feathers of the hen, to prevent their adhering to the eggs.

5. Food should be constantly kept near the sitting hens, that they may not be attracted away in search of food, to the neglect of their nest. Some hens are so assiduous in this duty, as to nearly starve themselves.

6. Hens should by all means be allowed to sit on the ground, as the rising damp assists very materially in incubation, whereas when the fowls sit upon floors or in erected boxes, the eggs become so dry and parched, as to prevent the young from disencumbering themselves of the shell, and in their exertions, forfeit their lives. Hens in a state of nature make their nests on the ground.

7. The progress of incubation is particularly interesting; the hen has scarcely set on the egg twelve hours, before some lineament of the head and body of the chicken appears. The heart may be seen to beat; at the end of the second day it assumes the form of a horse shoe, but no blood yet appears; at the end of two days two vesicles of blood are to be distinguished, the pulsation of which is particularly visible; one of these is the left ventricle, and the other the root of the great artery. At the fiftieth hour, one auricle of the heart appears, resembling a noose folded down upon itself. The beating of the heart is first observed in the auricle, and afterwards in the ventricle; at the end of seventy hours the wings are distinguished, and on the head two bubbles are seen for the brain, one for the bill, and two others for the fore and hind part of the head. Towards the end of the fourth day, the two auricles already visible, draw nearer to the heart than before; the liver appears towards the fifth day. At the end of 130 hours, the first voluntary motion is observed, at the end of seven hours more, the lungs and stomach become visible, and in four hours after this, the intestines, the loins, and upper jaw. At the end of the 144th hour, two ventricles are visible, and two drops of blood instead of the single one which was seen before; on the seventh day the brain begins to show some consistence; at the 190th of incubation, the bill opens, and the flesh appears in the breast; in four hours more the breast bone is seen, and in six hours after this the ribs appear to be forming from the back, and the bill is very visible, as well as the gall bladder, the bill becomes green at the end of 236 hours, and if the chicken be taken out of its covering, it evidently moves itself; at 264 hours the eyes appear, at the 288th the ribs are perfect; at the 331st the spleen draws near the stomach, and the lungs to the chest; at the end of 355 hours the bill frequently opens and shuts; at the end of the 18th day the first cry of the chicken is heard. It afterwards gets more strength, till at length it is enabled to set itself free from its confinement; at which time the mother's affection for her brood is always observed to be intensely increased, when she first hears the voice of her chicken through the shells, and the strokes of their little bills against them.

Hatching.

1. The chick makes a circular fracture at the large end of the egg, and a section of about one third of the length of the shell being separated, delivers the prisoner, provided there be no obstruction from adhesion of the body to the membrane, occasioned by the white of the egg becoming glutinous through the heat of incubation. When this happens, the

feathers stick fast to the shell, and the chick remains confined, and must perish unless released, which may be done by applying warm water with the finger or a rag, to the part. This will dissolve the glutinous matter. The chick may now be removed to the nest, and will in a short time extricate itself. Nevertheless, breaking the shell may sometimes be necessary, and tearing with the fingers, as gently as may be, the membrane from the feathers, which are still to be moistened, to facilitate the operation. The signs of a need of assistance, are, the egg being partly pecked, and the efforts of the chick discontinued for five or six hours. The egg may on some occasions be gently broken with a key.

2. Sometimes there remain several eggs, which to appearance are bad; to be certain, these should be steeped in blood-warm water, — if good, the chick will commence immediately to peck the shell, if otherwise, there will be no signs of animation. The rotten egg is also to be known immediately by the motion of the fluid, and previous unsteady incubation.

3. Those chicks which are hatched first, should be removed and placed in a basket of wool or soft hay, and if the weather be cold, set near the fire, at a moderate heat, where they may be kept till the brood be hatched, which may be many hours, during which time they will require no food. When all are released, the hen and chicken should be placed under a coop, in a dry situation.

Rearing.

1. The food with which the young may be fed on is, first, split grits or ground oats, and afterwards tail wheat; all water food, soaked bread or potatoes, are highly improper. Eggs boiled hard, or curd chopped small, are much approved by many, as first food. Their water should be pure, and often renewed, and may be given in pans constructed for the purpose, which will prevent the chicken from wetting themselves, and which is at all times highly injurious at first. Milk warmed, is better for young chicken than water.

2. Ground oats are deemed a serviceable food, when the chicken are a fortnight old, and it is not an uncommon way to give them potatoes steamed or boiled, mixed with oats, corn given, should always be well ground. In about six weeks, they may be fed on whole corn, such as oats, barley, or tail wheat.

3. It will be advisable to keep one brood separate from another, that is to say, not to have two so close together, as that they can associate since the hen will in all probability maim or destroy those chicken, which do not belong to her own brood, nor should they be placed adjacent to young fowls, as they are liable to tread on the chicken.

4. It is in general unnecessary to coop the brood more than two or three days, as they will thrive surprisingly on the foraging of the hen, but this depends on the natural disposition of the mother. They should not be let out too early in the morning while the dew remains on the ground, far less to range over wet grass. They should be guarded against unfavorable weather, for wet is the cause of the most fatal diseases among them.

5. The young brood will in a short time grow up so as no longer to require the attendance of the hen, which will be known by her leaving them, and roosting by herself. They may then be removed to the yard to associate with others of about the same age, at the age of from 3 to 5 months they will be fit for fattening. In spring, however, fowls thrive much better than in autumn, and may therefore be fatted when about eight or nine weeks old (this depends greatly on the hen) but at a later period of the year they will not be in a suitable condition until they attain the age of three or four months.

Fattening.

Among the various ways of fattening fowls, we have selected those which are considered the best.

1. Feeding the fowls in troughs opposite the coops, with ground oats and fresh milk, (to which some add a small quantity of sand), twice or thrice a day, in small quantities. After continuing this food for two weeks, a little mutton suet boiled to about the consistency of broth, may be added. Fowls kept in this way, quiet, will be fat in three weeks. Higlers usually keep the fowls in darkness after feeding.

2. The common method adopted for fattening large chicken and capons, is to cram them with oats, ground fine, mixed with a little coarse wheaten flour, in milk and water, given warm, and occasionally a little sugar, the last week to be wet up with mutton suet boiled, and the food made into rolls of about half an inch in length. Care should be taken not to force the cram so as to injure them. It is usual, previously to commencing this operation to give them two or three spoonfuls of warm milk. Fowls, by these means, will fat in a fortnight. Capons in three weeks. Capons are generally fattened about Christmas, during which time they are kept in warm rooms. Horsham, in Sussex, and Dorking, in Surrey, are the most noted of all country markets in England for their capons. Beer is used in their food sometimes, to open the body, while gin has a contrary effect.

3. Sir Isaac Coffyn mentions an expeditious way,—" he recommends putting the fowls in rows of pens, placed in a warm part, to cram them two or three times a day with meal, oats, wheat, small millet, maize soaked in milk; and to give them at first a small quantity of

this mixture in a rather liquid state, by reason that no drink is given them; to increase successively the dose, till it fills entirely the crop, allowing time enough to empty it at their ease, before the same manœuvre is began again, in order not to disturb their digestion. The cages employed in this mode are a series of small pens, in which each fowl is kept separate, in a manner cased up, and so closely wedged in, that it cannot move without great difficulty; all that it is allowed to do is to thrust its head through one hole, and void its excrements through another."

4. Sir C. M. Burrell, Bart, M. P. informs us that Sir C. Cockerwell has practised the East Indian system of fattening fowls with great success; by this system each fowl is kept in a separate pen, and as stench is injurious to their health, every pen is furnished with two sliding bottoms made of wicker work, which are changed and washed clean every day. The fowls are fed and crammed in the usual manner, the pens being put into a dark place, or otherwise covered with mats or cloths, so as to exclude the light; by this process the fowls are kept quiet, free from irritation, fattened in far less time and at a less expense than when kept together in the usual manner, and exposed to the light.

5. Fowls fattened in coops should be kept very quiet, and furnished with gravel, but no water, and as the object is to make them take as much solid food in as small a space of time as possible, barley meal should be mixed with water so as to form a fluid paste, of which their thirst will cause them to eat more than if the water had been supplied in a separate state. The food should not be put in troughs, but laid upon a clean board in the front of the coop, which should be washed clean every time it is used.

6. The following method of fattening fowls has been kindly furnished us by one of the first higglers in Sussex, as practised by him for many years with the greatest success. The fowls intended for fattening are in the first place kept without food for four and twenty hours, after which ground oats scalded and mixed with water to a moderate consistence must be given them, when sufficiently cooled, in troughs, three times a day, on the fourth day it will be necessary to add to the oats a little fresh milk, and in a fortnight from the time of taking up, the fowls will be sufficiently fat. This practice is recommended as being particularly adapted for the fattening of young fowls.

7. When fowls are large, and it is desirable to make them very fat, cramming will be necessary, but this should never be attempted until they have been kept for eight days at least upon barley meal, under coops, as before directed. Ground oats, and mutton suet chopped very fine, and boiled with a sufficient quantity of water, forms a good cram for this purpose. The fowls must be supplied with fresh warm milk once a day, when if they do not voluntarily drink it, a small quantity must be given them by means of a spoon.

CAPONS.

Capons, according to Sir Isaac Coffyn, " are cocks deprived of the faculty of reproducing, so that by prolonging in a manner their youth, they may preserve that white, tender, and delicate flesh, which they have in their first stage; and by being unexposed to the torments of love, and exhausted by its pleasures, they may in perfect repose, in absolute indifference, get fat at their ease, and come to a complete corpulency.

Young cocks should be emasculated at three months old, and as soon as possible before the month of July. The operation they go through consists in making an incision near the genital parts, and to thrust the finger through this opening in order to come at the testicles, and draw them away with dexterity, without hurting the intestines, to sew up the wound, and finally to cut off their comb. When this is done, they should be cooped for three or four days in a place where the temperature is not too high, to guard as much as possible against inflammation.

Capons, by a little careful management, may be trained to perform the business of a hen in sitting and rearing a brood of chickens."

Higgler's method of Killing, Picking, and Trussing Poultry.

A number of fowls are placed together indiscriminately into a large hamper provided for the purpose, with a hole on the top; from their numbers and confined situation, they soon become highly heated, when the higgler carefully takes one of the fowls by its legs and wings, holding them firmly together with the left hand, whilst with his right hand he breaks its neck, and immediately commences stripping the fowl of its feathers, the left hand being still employed in retaining it firmly in its proper situation. Such is the facility with which this operation can be performed, that a dexterous higgler will kill and pick fifteen fowls in an hour without difficulty. After the feathers are off, the fowls, while yet warm should be singed, floured, and trussed, and by being placed between two boards with the addition of a weight, the breast will be kept down, and they will then appear nice and plump.

Diseases of Poultry.

From a series of observations made on the diseases of domestic poultry, M. Flourens draws the following conclusions:—I. In these animals cold exercises a constant and determinate action on the lungs. 2. The effect of this action is more rapid and more severe the younger the animal is. 3. When cold does not cause acute and speedily fatal

inflammation of the lungs, it produces a chronic inflammation, which is pulmonary consumption itself. 4. Heat always prevents the attack of pulmonary consumption: when the latter has taken place, heat suspends its progress and even sometimes arrests it entirely, and effects a complete cure. 5. Pulmonary consumption is never in any state contagious: fowls affected with that disease were not only all day long with the healthy fowls, but at night roosted in the same places, without communicating their disease to them. 6. Lastly, the action of too long confined air exposes these animals to abscesses of the cornea, and inflammation of the ball of the eye. These abscesses and inflammations are also caused in a still more cruel manner, by cold, especially when accompanied with moisture.

TURKEYS.

The varieties bred in England are :—

1. Norfolk Black.
2. Copper.
3. White.

The great attention required in the rearing of young turkeys, is strongly urged by some as a reason for not keeping them at all; but it is certain where the conveniences are applicable, the turkey is profitable to the farmer. The natural habits of this bird are of a wandering nature, and where the soil is dry and premises extensive, they may be kept to advantage. In a wild state they usually roost in high trees, in a domesticated state they may be permitted so to do in warm weather.

Laying.

1. They frequently lay their eggs away from home, which, when done should be removed and another nest formed; the hen will then continue as usual, and will not be a restriction to incubation.

2. The number of eggs layed previous to incubation, is usually from fifteen to twenty, or upwards.

3. One cock is quite sufficient for five or six hens.

Sitting.

1. The number of eggs generally put under the hen, is from ten to fifteen. The time usually occupied in sitting is twenty-eight to thirty days.

2. To bring up turkeys from under a hen is often found advantageous, as the young turkeys will become habituated to the manner of the chicken, and will not be so much inclined to wander away as they otherwise would.

Hatching and Rearing.

The hen turkey after hatching her young may be confined under a coop out of doors, if the weather is fine for a month or six weeks. During which period, the young turkeys are to be fed on ground oats mixed with cheese curds. When kept out, the coop should be covered up during the night, and removed frequently from one situation to another. This continued for the time specified, the young will, if healthy, soon become strong, when they may be fed on ground oats or a little whole barley, with young cabbage or lettuce leaves.

Turkeys should be daily fed on coarsely-ground malt mixed with barley or any other meal which the district in which they are kept, may afford; but vetch, and marrow-fat pease are very injurious to young turkeys.

Fattening.

At six months old they may be fattened with ground oats mixed with milk and a little sweet mutton suet. Those intended to be fattened for Christmas consumption should be put up about a month before they are wanted, when they may be crammed in the manner previously directed for chicken.

Diseases.

1. It is supposed that were a little blood to be taken from the axillary vein of either wing, turkeys might be saved at that critical period of time termed the shooting of the red; they are generally affected more in cold than in warm weather, and if care is taken to strengthen them with crumbs of bread soaked in wine, or paste mixed up with pepper, fennel, parsley, or hemp seed, they will in general recover.

2. "In their younger days, it is remarked that they are subject to a disease, which shews itself by very strong symptoms of weakness; they soon perish if care is not bestowed upon them. The tip of the feathers of the wings and tail of black turkeys become white, the plumage bristles up all over the body, they have a languishing aspect, and housewives then call them heated turkeys. On examining attentively the feathers on the rump, two or three will be found, whose quill part is filled with blood. The extraction of these soon restores the animal to health and strength. They are sometimes costive, at other times they have a looseness; to these two opposite diseases only a single remedy is applied, that of warming them."

3. Young turkeys when ill, look dull and hang down their wings, they must be taken

from the male and put near the fire, and their feet wrapped up in a little hemp, lest they peck at them; they are made to swallow some pepper corns, food is laid before them several times in the day, and they are not to be returned to their mother before they are quite strong again. At a more advanced age, a swelling takes place in their head, which is cured by facilitating the discharge at the nostrils, and by rubbing them with fresh butter. The head is sometimes covered with pimples, these are to be fomented with a decoction of which vinegar is the basis, the disease sometimes terminates fatally, and to avoid the total loss of the animal the head is cut off, and the turkey eaten.

5. When turkeys have been severely injured by an exposure to the severity of cold, and apparently deprived of life, they may sometimes be restored by placing them on warm ashes, in a very warm situation, and as soon as life appears made to swallow some hot wine, and afterwards placed in a basket of feathers.

GEESE.

Geese are profitable where convenience will allow them to range, as they require but little attention. There are several varieties, but the largest are chosen as best for stock.

Laying.

1. The fruitfulness of geese is extreme. When well fed, states Sir James Coffyn, they can make as much as three lays a year, each composed of twelve eggs; and if one is careful in taking them away as fast as deposited and no interruption is offered, they will lay as many as forty or fifty, which produces considerable profit. As an essential precaution, as soon as it is perceived that the geese are desirous of laying, coop them up under their roof where nests made of straw have been prepared; and as soon as the first egg is laid, they will continue to lay successively in the same place, the goose may always be known when about to lay, by her carrying a fine straw in her mouth. If the situation she has selected is unfavourable, she may be enticed away by placing straw in a proper situation, and strewing some stinging nettles over, to which all geese are very partial.

Sitting.

Fifteen or twenty eggs may be put under one female. The eggs are one month in hatching. The common food is barley mixed up with water, both of which should always be placed near the nest, to prevent the geese quitting their eggs. An economical way of obtaining goslings is by employing turkey hens to sit in the place of the goose. This function of the goose being thus filled by another, she is not drawn off from laying, and yields eggs in great abundance.

Rearing.

In rearing, the food should consist of coarsely ground barley, bran, and raspings of bread, which will be rendered still better by being soaked and boiled in milk; or curdled milk, melilot, lettuce leaves, and crusts of bread boiled in milk, are frequently employed; in Sussex ground oats and goose-grass or cleavers (*Galium Aparine*) chopped very fine, are extensively used as food for young goslings, which should be regularly fed twice a day, and well protected from cold. About Midsummer they will form good green geese, provided they have been well fed. After harvest, the broods may run in the stubble when the corn is cleared, and at about Michaelmas they will become very fine.

Fattening.

If put up to fatten, the cheapest way is to boil or steam a quantity of potatoes, and to every bushel of which, a gallon of boiled buck wheat should be added, with this food, the geese will become fat in about three weeks. When buck-wheat cannot be procured, ground oats may be substituted. A little sand should be mixed with their food and plenty of water allowed them into which a few wood ashes are sometimes put. The food should always be given moderately warm and in the last week of fattening, a little ground barley may be added. Whole oats are however preferred by some.

Diseases.

1. Geese are particularly subject to two diseases: the first is a diarrhœa; they are then made to take, with success, hot wine in which the parings of quinces, and juniper berries, are boiled up. The second is a giddiness, which makes them turn round for some time. The remedy is to bleed the birds with a pin or needle, by piercing a rather prominent vein situated under the skin, which separates the claws.

2. Cold and fogs are extremely prejudicial to geese, therefore when young care should be taken not to let them out but in fine weather, when they can go to their food without a leader.

3. Little insects are a great scourge to young goslings; to dislodge them place some corn, on their return from the field, at the bottom of a vessel full of clean water. To get at this corn the goslings are compelled to plunge their heads into the water, which obliges the insects to leave their prey.

4. Care must be taken to root out all henbane, hemlock, or other poisonous weeds; as the geese will, without discrimination, partake of these, and death will ensue.

DUCKS.

There is a great variety of species.

Ducks lay from twelve to twenty eggs before they are inclined to set, and when they do, great care should be taken that food be kept near at hand. The eggs are hatched in about a month. One drake is sufficient for four or five ducks. When hatched the ducklings should be kept in a warm place, and fed on a few crumbs of bread, grits and barley meal, boiled and steamed potatoes, well mixed together; fresh sand and clean water should be constantly kept in shallow pans. They should be kept clean and have plenty of fresh straw afforded them. The young may have their liberty when strong enough, which will be in a fortnight or three weeks, if the weather be warm.

In Britain, ducks are fattened by means of ground oats, or malt mixed up with water or milk, In Lower Normandy, where a trade is carried on with them, because the soil is very cool there, a paste is prepared with the flour of buck wheat, which is made into small lumps, with which they are crammed three times a day, during eight or ten days, after which they are good, and sell at a price which indemnifies the breeder for his trouble and expense.

PIGEONS.

Buffon enumerates about thirty different varieties.

Pigeons are not very profitable to farmers as they eat a great deal of corn, and do considerable damage to young crops.

They sit about ten or twelve times a year, seldom if ever laying more than two eggs at a time, they sit from fourteen to seventeen days. It is observed that one generally proves a male, the other a female.

On a supposition that we allow pigeons to breed nine times in the year, the produce from a single pair at the end of four years may amount to the number of 14,762. Linnæus makes the number amount to more than 18 thousand.

Besides pigeons being esteemed as a delicacy for the table, they are valuable on account of their dung, which is a good manure, and is also used for tanning the upper leather of shoes.

W. B.

PRUNING.

On the Pruning of Fruit Trees, &c. By C. Harrison, Esq. F.H.S.

ON PEACH AND NECTARINE TREES TRAINED AGAINST AN OPEN WALL.

The formation of the border, and the selection of the soil in which to plant this class of trees, is of the utmost importance in order to their success.

The border ought always to be upon a dry bottom. If this is not naturally so, it ought to be made so. The bottom should be made impervious to the roots, but at the same time be so constructed that all superabundant water may be readily conveyed away from the soil.—(For the mode which I recommend and practice in the formation of borders, see my Treatise on Fruit Trees.]

The soil which is most suitable for this class of trees, is a moderately strong loam; such a soil as if taken up in the hand and allowed to fall to the ground, will readily separate.

The best time for planting the trees, is the end of October, or early in November.

In planting, care should be taken not to plant deep, but so that the roots may run near the surface of the border.

At no time permit any crops of vegetables to grow upon the border that root more than a few inches deep, and never allow the border to be dug deeper than six inches.

In planting fruit trees care should be taken to spread the roots in direct

lines from the trees, and always avoid laying them near the side of the wall.

When the trees have been planted at the season directed, they must not be headed down till the spring. At that time each tree may be headed down to four or six buds, as the vigour or weakness of the tree may point out necessary.

When the tree pushes, attention must be paid to the regulation of the young wood in the following manner:—

All foreright shoots, i.e. such shoots as are produced on the opposite side of the branch to the wall, must be rubbed off when they are two or three inches long. When the shoots left have pushed six inches, it will be necessary to have them secured to the wall or trellis, in a regular fan method. If a tree push weakly, it should have the shoots trained more erect, till such time as they become vigorous; when they may be trained as before.

If during summer the shoots produce lateral ones, they should be trained in, excepting foreright ones, which should be taken away.

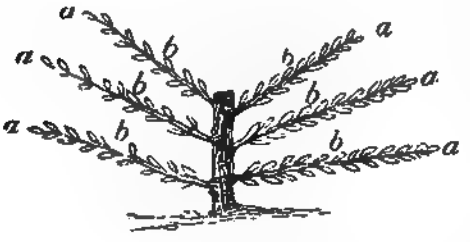


Fig. 1

At the winter pruning of the trees, the leading shoots, as Fig. 1, a, a, a, a, a, a, must be cut down to one quarter, or one half of their length, according to the vigour of the tree as at b.b.b.b.b.

The four or six shoots now remaining are to form limbs for the tree, when during the second summer, they push shoots, all forerights must be taken away, and as many new shoots left as will make up with the mother shoots ten or twelve,—for a low wall, ten will be sufficient, and twelve for a high one; one shoot should be left as near the origin of each mother shoot, as possible, as at a, Fig. 2 and one at the extremity for the head of the last year's branch, as at b. If such shoots are conveniently placed on the branch, and are at the upper side of it, such should be preferred.

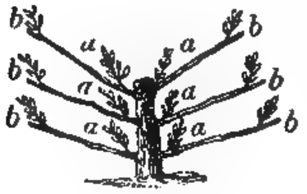


Fig. 2.

The summer treatment, after this regulation, must be as directed before.

The shoots now remaining, are those which are to form the main limbs of the tree, and should be regularly disposed against the wall. Besides those now left, as the tree advances in size and extent, a few other lateral limbs will be required, so as to fill the wall in every part.

Trees of the class under consideration, have a general tendency to run naked near their centres, and it will require very particular attention to prevent it. This injury may be avoided, by uniformly leaving the lowest new shoots upon each mother shoot, and giving such shoots all possible encouragement, during summer. This third summer, a shoot must be left at the under side of each of the last year's shoots, Fig. 2. a, a, a, a, a, a, these may be trained in for lateral limbs, and will fill up at the under side of each main limb, as Fig. 3, a.a.a.a.a.a.

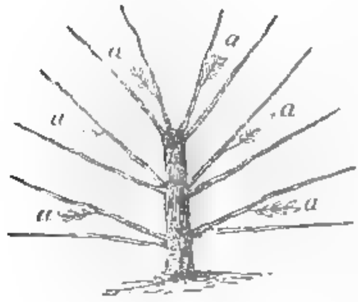


Fig. 3.

The above directions being attended to, not only will a tree be regularly formed, but it will be equally furnished in every part, and may be more certainly kept supplied with bearing wood up to the centre of the tree than by any other mode I ever saw adopted. If many more main limbs than I have recommended were allowed to a tree, the greater part of its strength would be uselessly expended in the number of limbs instead of being employed in strengthening the fruit bearing shoots, and bringing the fruit to a larger size, and better flavor, such is one of the evils of the Seymour system with this class of trees.

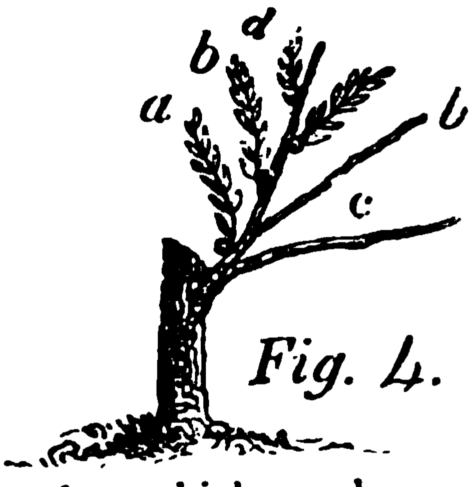


Fig. 4.

In the summer regulation of the tree, after coming to a bearing condition, not more than two new shoots should be left upon each strong shoot of the previous year, which should be the lowest shoots and the highest, as Fig. 4, a, d, whether they have fruit at their basis or not. Such of the intermediate shoots, as b, b, that have fruit at their basis, must be left till the fruit is stoned, when they may be cut back to about an inch long. Also any other shoots not wanted for the next year's supply for bearing, may now be cut in, or entirely removed, to give all possible encouragement to the fruit, and necessary shoots for next year. At the winter pruning, all that part of each shoot of the previous year, as well as any shoots or parts of shoots of the last season's produce which may be upon it, must be cut away, down to the lowest, as Fig. 4, c, excepting there should be a want of wood, when the uppermost may be left. The shoot must be cut into one half its length, and, in weakly cases, to one third.

It sometimes happens that a young shoot will push from near the origin of the main limbs; any such if suitably placed, should be encouraged for a future supply of bearing wood up to the centre.

The fruit bearing shoots ought not at the winter pruning, to be trained in nearer to one another than from five to six inches; if closer than this distance, the shoots will be weakly afterwards, and the fruit small.

When any part of the tree is becoming too crowded with wood, it will be necessary at the winter pruning to cut back some portion of a lateral limb or branch ; this may be done safely when the limb is not very strong, taking care to cut clean to another younger vigorous shoot or branch. If a limb be strong, it will be advisable not to cut it prefering a younger branch in its stead, for the system of this class of trees is much damaged by any large amputation, and the less the knife has to be used in winter pruning the better, I uniformly avoid it as much as possible, and when a tree is run out I replant with some previously prepared trees rather than trust to the old tree being headed down, as these never do much good afterwards.

The young wood of the trees should always be carefully laid in, in summer, as straight as possible, so that it can be neatly trained in at the winter regulation.

The fruit should be thinned out at twice, first where there are clusters of them when they are as big as field beans, and finally after the fruit is stóned, leaving one every six inches.

When, from accident, a tree has got bruised, cut the part out clean with a sharp knife, as the wound always heals much quicker after a bruise, than a cut.

The time I recommend for performing the operation of winter pruning the trees, is as early as it can be done, generally by October ; this affords much encouragement to the buds of those shoots intended for next year's bearing.

When the trees are attacked with insects, I have an immediate recourse to remedies. as if delayed a few days, the leaves are often so injured upon these shoots for the next year's produce, that the lower parts of the shoots are frequently seen to drop their leaves in May or August, consequently the bud at the base of each fallen leaf comes to nothing.

The best remedy for destroying the green fly is, tobacco water, or tobacco liquor which may be purchased at, from ten-pence to one and two-pence per gallon.

A good remedy for the mildew, is common sulphur sprinkled over the affected parts of the tree. To destroy the red spider, a portion of sulphur should be sprinkled at the under side of the foliage after a very forcible washing with water or soap suds, which latter is the best.

ON THE APRICOT TREE TRAINED AGAINST AN OPEN WALL.

A soil suitable for the peach will be proper for the apricot.

The more vigorous growing sorts should be trained horizontally, and the other kinds in the fan method, of the latter is the orange and Moor-park ; of the former, the Turkey and others The formation of the trees after the fan method must be in all respects as directed for the peach ; the horizontal training must be pursued by training up a leading upright centre shoot, and cutting it back each winter when arrived to runing, so as to produce side shoots.

The treatment of the tree in a bearing state is, to train in a sufficiency of young well-placed shoots during summer, and to cut them into about one half their length at the winter pruning. Instead of rubbing off all shoots not desired to be trained in at the summer's regulation ; such shoots must be cut down in order to produce spurs, which will produce fruit abundantly. Such shoots require to be cut in so as to keep them vigorous, and as near the wall as possible.

ON PLUM AND CHERRY TREES TRAINED AGAINST AN OPEN WALL.

These in all respects should be trained as directed for the apricot, excepting that the horizontal mode of training is best for them, their progress to luxuriance being checked by it. The nearer such spurs are kept to the wall, the more certainty there will be of an abundance of fruit, and of a superior kind.

ON THE APPLE AND PEAR TREE AS TRAINED AGAINST AN OPEN WALL

These sorts require a stronger soil than any of the preceding sorts. The horizontal mode of training is the most suitable. The fruit is produced upon spurs, such spurs should be

kept thin of lateral ones, not permitting more than from four to six blossom-buds upon each principal spur, all others being cut away. Care must be taken to keep the spurs as short as possible, otherwise they will not be so likely to perfect their buds. Any tree proving too strong should be taken up and replanted, which will check its luxuriance and throw it into a bearing state. I have frequently performed this with very large trees, and always found it successful.

Petworth, June 22nd, 1830.

QUINCE,

The Quince (*Py'rus Cydónia*), Icosándria Di-Pentagy'nia, Linn.; and Rosáceæ, Juss.

There are four varieties in cultivation:

1. The Pear-shaped Quince, with oblong leaves and fruit.
2. The Apple-shaped Quince, with ovate leaves, and rounder fruit.
3. The Portugal Quince; fruit oblong, more juicy and less harsh, cultivated for marmalade, as the pulp assumes a red or purplish tint when prepared.
4. The Mild or Eatable Quince, less austere than any other.

Of these varieties, the Portugal, although a shy bearer, is generally preferred.

Culture, &c.

Soil.

The Quince prefers a moist rich soil, and sheltered situation, and is almost invariably trained as a standard tree.

Propagated.

1. By layers, cuttings, and by grafting.
2. The time of planting, mode of bearing and pruning, are the same in every respect as that of the apple and pear,

Use.

1. The fruit is seldom eaten in its raw state, but stewed, or in pies and tarts, along with apples, is much esteemed.
2. In confectionary it forms an excellent marmalade and syrup.

RADISH.

Radish (*Ráphanus Sativus*), Tetradynámia Siliqúosa, Linn.; and Cruciferæ, Juss.

The cultivated radish is a native of China. Its varieties are divided by Mr. Strachan into the spring, autumn, and winter kinds:—

1. *Spring and Summer kinds.*

Long Sorts, Scarlet or Salmon-coloured and its subvarieties.

Short topped Scarlet, and Early Frame Scarlet, which are the two sorts most generally cultivated.

Purple, an early sort of good flavour, but at present neglected.

Long White, the original variety cultivated in Gerrard's time, white, semi-transparent and delicate.

TURNIP RADISHES.

White: root globular like a turnip.

Early white, a subvariety.

The Pink; rose colored, scarlet, and crimson, are names applicable to one sort, which approaches to the pear shape.

2. *Autumn Kinds.*

White Russian; the root larger than any of the long rooted kinds, white, tapering like a carrot, flavour nutty, like that of the rampion.—(*Hort. Trans.*)

Yellow turnip; root large, ovate, yellow or dusky brown, and rough without, but the flesh white.

Round Brown; root large, shape irregular, externally marked with greenish brown, and the flesh soft and of a greenish white.

WINTER RADISHES.

White Spanish; root large, oval, outside white, tinged with green, flesh hot, firm, solid, and white.

Oblong brown; root middle-sized, pear shaped, outside coat rough and brown, marked with white circles, flesh hot, firm, solid, and white, plant very hardy.

Black Spanish; root large, irregularly pear-shaped, rough and black externally, and the flesh hot, firm, solid, and white, very hardy.

Purple Spanish; a subvariety of the black, with a purple skin.

The character of a good long radish is to have its roots straight, long, free from fibres, not tapering too suddenly, and especially to be fully formed on the top, or well shouldered as it is called, and without a length of neck; the roots should be ready to draw whilst the leaves are small, whence the name short top radish, and if they soon attain a proper size, as well as force well, they are then called early and frame radishes. (*Loudon Gard.*)

Estimate of sorts.—The spindle-rooted varieties are generally sown for the first crops, the small turnip-rooted for the spring or secondary crops, or in summer and autumn for more considerable supplies. The winter kinds being of a hardy nature are frequently cultivated for winter use.

Culture, &c.

Soil.

The seed should be sown on a light mellow soil, well broken up by digging; and for sowings, made in the middle of October, and the same time in February, the situation should be a dry sheltered border, lying open to the full mid-day sun; and from the middle of February to the end of March a more open spot will be suitable, and as spring and summer advance the situation should be cooler.

Propagated.

By seed sown either broadcast or in shallow drills. For a bed four feet six inches, by twelve feet, two ounces of seed will be required for the spring sorts, and an ounce and a half for the autumn varieties. The drills should be from four to six inches asunder, and they may be made very regular by adopting the following method; choose a light and mellow soil not rankly manured, dig it well, and make the earth fine. Stretch the line and strike out the drill with the sharp angle of the hoe half an inch deep. Lay a straight pole like the handle of a hoe or rake, and about six feet long in this drill, and press it gently down with the foot, repeat the operation according to the length of the drill, and it will make the bottom smooth, of an equal depth throughout, giving at the same time a degree of solidity to the earth; scatter the seed equally but not very close, draw earth over the seed of each drill separately, or make all the drills first, then sow the seed, rake the bed and press it level with the flat of the spade. The beds for radishes should not be more than four feet wide, with alleys between them and the next adjoining beds; let the drills be half an inch deep for the spindle-rooted kinds, and three quarters of an inch for the small turnip-rooted.

Time of Sowing.

The early short-topped and salmon among the spindle-rooted, and the small white and red among the turnip-rooted may be sown for succession crops every fortnight from the latter end of February till the middle of May. The spindle-rooted varieties alone are cultivated for early crops; and the market gardeners, who raise great quantities of early radishes, sow in December or January, or earlier; and cover the beds with straw to the depth of several inches. It will generally be prudent to protect the newly formed beds with coverings of light branchy boughs, which may be kept in their places by heavier sticks placed across them. Birds delight in the seed of the radish, and their attacks must be prevented; the hedge sparrow is very active in turning up fresh sown seeds, particularly those of mustard for salad. The large turnip radishes require more space, for they grow to the size of a small turnip; they should be sown in July and August, for autumnal and winter supply. The sowings should be performed in a manner similar to that mentioned for the smaller sorts, but the drills should be at least three quarters of an inch deep and six or eight inches apart; the plants must be thinned as they advance to the distance of six inches from each other. Water in dry weather.—(*Gard. Manual.*)

To save seed.

It will be proper in March, or early in April, to remove some fine well-shaped roots, having compact and short tops; set them with the dibbler as deep as the leaves, which must not be cut off. Keep the different varieties remotely apart, and when the stems have attained the height of about eighteen inches, fasten them to stakes fixed firmly in the ground. These plants will ripen their seeds in August and September

Use.

The roots are eaten raw in spring, summer, autumn, and winter. The young seed-leaves are often used as small salading in spring; and the seed pods while young and green are pickled, forming an excellent substitute for capers.

RAPE.

Rape (*Brássica Nápus*), Tetradynámia Siliquósa, Linn.; and Crucíferæ, Juss.

The Rape is a Biennial Plant of the Turnip kind, and may be considered to rank amongst the most useful and valuable plants to the Agriculturist.

Culture, &c.

SOIL.

The soils best suited for Rape are the deep, rich, dry and kindly sorts; but with good deep ploughing and plenty of manure it may be grown to advantage on fresh broke up land.

The preparation of old tillage land for rape is in every respect the same as for turnips.

PROPAGATED.

By seeds, sown either broadcast or in drills. The broadcast system is at all times preferable, especially if the object is the keep of sheep in autumn and winter, by eating it down.

Quantity of seed.—If sown thick, about a peck of seed per acre, will be required, but if drilled or sown thin, two or three pounds will suffice.

The time and the manner of sowing whether broadcast or drill, is the same as for turnips.

PLANT.

Transplanting.—It has been suggested as a desirable method to sow the seeds in beds, for the purpose of being afterwards transplanted into the fields, and set out in the manner of cabbage plants. Half a rood of land in this way would be sufficient to furnish plants for five or six acres, when the best plants of equal growth may be selected in order that all the seed may ripen at the same time. The transplanting should commence as soon as possible after the corn harvest as it is generally performed on land from which a corn crop has just been taken. One deep ploughing and a sufficient degree of harrowing being given, the plants may be dibbled in rows a foot apart and about six inches in the row, The plants intended for transplanuation should be sown in the months of June or July, preceding the transplanting season. It is the practice of some to transplant by laying the plants in the furrow made by the ploughing, but as the roots cannot be firmly fixed into the ground by this method, dibbling should be preferred.

After Culture.

The after culture is the same as the turnip, and consists chiefly in hoeing and thinning. The plants on very rich soil may be thinned out to twelve or fifteen inches with advantage to the seed, but on the poorer soils, six inches is quite a sufficient distance. If rape is grown entirely for the keep of sheep, no hoeing or weeding will be necessary.

Harvesting.

The seed generally ripens in June or July (according to the season) which is shown by the pods putting on a brownish appearance and the seeds of some of the forwardest plants turning black. As soon as these appearances present themselves, it should be immediately cut, otherwise much seed may be lost. It is usually reaped with the sickle and laid in rows till sufficiently harvested, when it should be thrashed and cleaned on a sail cloth in the field where it is grown being conveyed to the part of the field where the thrashing operation is going on by means of sledges, the bottoms and sides of which are lined with cloth, in order to prevent any loss of seed; after which it should be spread out thinly in the field if the weather will admit, or over a barn, granary, or other floor, and frequently turned; as being placed in heaps, it is liable to heat and become musty.

USE.

1. *The use of the seed* for crushing for oil is well known; it is also frequently used for birds, and is sometimes sown in the garden in the manner of mustard and cress for early salad.

2. *The rape dust and cake,* consisting of the husks, which remain after the oil has been expressed, are used in a pulverized state as top dressings to various kinds of crops, as clover, wheat, &c. but more generally turnips, in which case it is either drilled in with the seed or sown broad cast. The common method of sowing it broad cast requires one ton of cake to three acres, whereas by reducing to a very fine powder and drilling it in with the seed, the same quantity will be sufficient for six acres. The success of this manure however depends in a great measure upon the season. If rain happens to fall soon after it is sown, the crop will be found to be generally abundant, but if no rain fall for a considerable period the effects will scarcely be discernible.

3. *The haulm* is an excellent food for cattle, the *stover* or pods and points as they are called, broken off in thrashing being as acceptable to them as hay. The offal makes

good litter for the farm yard. The haulm is frequently burned and the ashes sold, which are nearly equal to potass.

4. *The leaves* as a green food for sheep, is scarcely to be surpassed by any other vegetable. In this application the crops are fed off occasionally from the beginning of November till the middle of April, being found of great value, in the first period for fattening of dry ewes and old sheep, and in the latter, in supporting ewes and lambs. It is sometimes given to cattle, but when they are put on this food in its green state, care is necessary that they have not too much at first as they are very liable to be *hoven* by it.

RASPBERRY.

Raspberry (*Rubús Idœus*) Icosándria Polygámia Linn. and Rosâceæ, Juss.

The raspberry is a native of Britain, and is found in its wild state in mountainous woods and thickets. Mr. Borrer has discovered it in some of the forests in Sussex, and it may now be seen growing in a perfectly wild state at Founthill, Newick, in the same County. The root of the raspberry is considered to be perennial, but in fact, the perpetuation of the shrub consists in the annual production of a succession of suckers or young shoots which grow during one summer, mature their wood in the following autumn, and bear fruit in the succeeding year. These protrude other suckers from their roots ; after which they die down to the ground; thus there exists always two kinds of shoots, one bearing the fruit, the production of the preceding summer, and the other in a green growing state, destined to produce the fruit of the next year. On the peculiar growth of the raspberry the Author of the *English Gardener* observes "it is very curious that in the northern Countries of America, Nova Scotia, and New Brunswick, for instance, the raspberry plant dies completely down in the fall of the year, and new shoots come up again out of the ground in the spring, much about the manner of *fern*. These shoots bear the *first* year, though they do not make their appearance above ground until June ; and where the land is clear of high trees, and where the August sun has shrivelled up the leaves of the raspberries, these shrubs form a sheet of red for scores of miles at a stretch. They are the summer fruit of the wild pigeon, and of a great variety of other birds."

There are twenty-three varieties of raspberries enumerated in the Horticultural Societies' catalogue, some of which possess excellent properties, of these, the Antwerps, Canes, and a few others are the most generally cultivated.

ANTWERPS.	CANES.
Double bearing yellow.	Common red, *old red, wild red.*
Late bearing Knivett's Antwerp	Rough.
Red, or barley.	Smooth.
Yellow, or *white Antwerps.*	Red.
	Brentford.

Double bearing.—Twice or double bearing, *red double bearing* Siberian, or *perpetual bearing.*

William's double bearing, red, or pitmaston.

REDS.	WHITE.	VARIOUS.
Woodward's globe.	Old white	Cornish.
Wilmot's early.		Lord Exmouth.
Malta.		Prolific early.
Taylor's Paragon, or *scarlet paragon.*		Superb.
		Spring grove.
		Barnet.

Cornwell's prolific, Cornwell's seedling, Cornwell's red and large red are supposed varieties of the Barnet.

The twice-bearing ripens its first crop in July, and its second in October ; but those of the last crop, unless in very fine autumns seldom have much flavor.

Culture, &c.

SOIL.

A deep rich, light loam, trenched two feet deep, and well manured in the first instance, is most suitable to the raspberry.

PROPAGATED.

By seed, to obtain new varieties, and these, according to Abercrombie, may be perpetuated, by young sucker-shoots, rising plenteously from the root in spring and summer. When these have completed one seasons growth, they are proper to detach with roots for planting, either in the autumn of the same year, or the next year, in February or March, but not later than the middle of April. These new plants will bear some fruit the first year, and furnish a succession of strong bottom-shoots for full bearing the second season.

Aspect, Planting, and Pruning.—They may be planted, says Abercrombie, in any open ground in the kitchen garden, *&c.* and if for a full plantation you should plant them in rows ranging south and north, a yard and a half asunder, by two or three feet distance in the rows; having for this purpose a quantity of young suckers of some good bearing plants dug up in autumn, winter, or spring, with good roots, of which trim off any long straggling and woody parts, and prune the weak tops, then plant them either singly or two or three together, at the distance above named; or they may be disposed in patches, in borders, or shrubberries singly or two or three together, in a sort of clump. In their culture observe, that as the same individual shoots never bear but one year, they decay to the root in the winter following, young ones being produced from the bottom in summer to succeed them, the old stems must accordingly be cut down to the ground every winter, and the young ones thinned to form three or four to five or six of the strongest stems on each stool or root; prune them at top, cutting off the weak and bending part; and as soon as pruned, let the ground be dug between the rows, *&c.* and clean out all straggling plants that are distant from the main root.

Mc Phael says, they may be pruned any time in the winter, in open weather; but the safest way is to do it early in the spring, when the most severe frosts are over, for in some seasons raspberry shoots after pruning are killed by hard frosts.

'It is a good plan, says Harrison, to train raspberries against a trellis. In planting, let them be placed singly at ten inches apart, and both sides of the trellis be planted. The raspberry requires a summer and a winter regulation. The first is about midsummer, or a little later; in doing which, pull up or cut clean away to inside the soil; all suckers, except about eighteen or twenty to every bush, and to as many more as will be wanted at the winter pruning against the trellis. By doing this, the fruit is improved in size, and the shoots which are to bear next year, get well matured. Whatever shoots are produced after this regulation let them be destroyed by pulling up as soon as they are a foot or half a yard high. At winter pruning let all the shoots which bore fruit last summer be cut clean away close to the ground, and to every bush leave about eight or ten of those shoots produced last summer, cutting clear away all others; after this is done they must be tied together, so that two bushes will form an arch. After being tied, let a few inches be cut off the ends of those trained against a trellis, leave as many good shoots, to bear next year as will be ten inches apart, pruning a little from the ends, and then tying them to the trellis. If the plants are not very vigorous some well rotted manure must be dug in round the roots but not deeper than four inches. Raspberries will bear for eight years from the time of planting, when they must be destroyed; but two year's previous to this, a new plantation must be made in some other place, so that when the old ones are destroyed this will be in a good bearing condition.

Experience proves that to have a constant supply of fine fruit year after year, the ground must be frequently changed. Thus after the raspberries have borne fruit four or five years, one or two rows should be taken up, the strongest suckers selected and immediately planted in fresh ground, which has been deeply dug and well prepared with manure; the early spring is better for this work than the autumn. In two years more, the same number of plants should be removed, and the strong suckers planted in rows adjoining those last set out, and thus proceeding before any of the old plants give out, a new plantation will supply its place. The stock of bearing plants whether they be planted against a trellis or bushes, may be added to or diminished according to the supply required.

A light trellis or rail work is certainly to be preferred, provided it be constructed with slender stakes, and a top railing of Pseudacacia (locust), or elder, which woods are scarcely affected by water, and consequently do not readily undergo decomposition. On such a trellis the plants could be secured from the force of winds, and the fruit would derive improvement in consequence of its open exposure to the sun and air.

Whenever raspberry plants are removed to another situation the old ground ought to be well manured, deeply dug and turned, and then it should be placed under some vegetable crop. By this mode of treatment it will be brought into a condition to support raspberries again in two or three years. This is a curious and interesting fact, one which proves that it is not solely by exhausting the soil that certain plants deteriorate if planted on the same ground, year after year; for where this is the case manuring would renovate

the ground; but it fails to do so, and thus if peas or wheat, for example, be grown repeatedly on a piece of land the farmer may manure to whatever extent he chooses, his crops will dwindle and become poorer and poorer. This is remarkably the case in the Isle of Thanet, where, to use the local term, if the land be "*over-peaed*" it becomes as it were poisoned and if pease be again planted, though they rise from the soil, they soon turn yellow are "*foxed*" and produce nothing of a crop. To account for this specific poisoning of the soil we must suppose that *particular plants convey into the soil, through the channels of their reducent vessels, certain specific fluids, which in process of time saturate it,* and thus render it incapable of furnishing those plants any longer with wholesome aliment; in fact the soil becomes replete with fæcal or excrementitious matter, and on such the individual plant which has yielded it, cannot feed; but it is not exhausted, so far from that, it is to all intents and purposes manured for a crop of a different nature; and thus by theory, of interchange between the fluids [of the plant, and those of the soil, we are enabled philosophically to account for the benefit which is derived from a change of crops.—(*Domestic Gardener's Manual.*)

USE.

The fruit being very agreeable to most palates, is employed at the dessert; and is likewise much esteemed for sauces, jams, and tarts. This fruit like the strawberry not undergoing the acetous fermentation in the stomach, is recommended by some as a useful auxiliary in gout and rheumatism.

RHUBARB.

Rhubarb (*Rhy'um*) Enneándria Trigónia Linn.; and Polygóneæ Juss.

Rhubarb is a perennial plant. There are three species in cultivation:—

1. The Rhapontic or Thracean Rhubarb (*Rheum Rhaponticum*,) introduced in 1573, has smooth leaves and somewhat furrowed, reddish footstalks; it is the species commonly cultivated in gardens. The stalks of the leaves after being peeled are cut into pieces and made into pies or tarts.
2. The Hybrid Rhubarb (*Rheum Hybridum*).—A native of Asia, introduced in 1778, leaves large and smooth, somewhat heart shaped, produced on very long petioles, or foot stalks; which sometimes measure from three to five feet; these are also peeled and used in pies and tarts.
3. Palmate-leaved Rhubarb, (*Rheum Palmatum*).—A native of Tartary, introduced about 1758; leaves hand shaped, deeply cut, the lobes or divisions pointed. The footstalks are sometimes used, but it is principally cultivated for its roots, which being dried are occasionally employed for medicinal purposes.

Culture, &c.

SOIL.

A light rich sandy soil well manured, seems best adapted for the successful cultivation of Rhubarb.

PROPAGATED.

By seed which is the best method. Sow the seed in spring in drills made in rich light earth, and when the young plants attain an inch in height keep them eight inches asunder. In autumn, transplant them into beds of light rich earth, well pulverized and manured to the depth of two feet. The plants of the first and last species may be set in rows, three feet asunder, the plants two feet apart; but the Hybrid Rhubarb will require a space of from three to four feet between plant and plant; hence the beds should contain only two rows of the latter and three rows of the two former species.

2. *By dividing the roots.* In dividing the roots care must be taken to retain a bud on the crown of each section, when they may be planted where they are finally to remain.

After culture.—The subsequent culture consists in keeping the rows free from weeds, in digging deeply between them with a fork and manuring with rich vegetable compost every autumn. A plantation will continue good for many years, some never allow the flower stalks to produce flowers, and others cut them over as soon as they have done flowering, to prevent the plant becoming exhausted by an over production of seed. The former seems the preferable mode as the flower-stalks of plants cannot like leaves, be considered as preparing a reserve of nourishment for the roots.

Taking the leaves and method of blanching.—In the first season after planting, some of the leaves may be taken off, remove a little of the surrounding soil and detach the leaf by a pull sideways, not by cutting with the knife. Knight's method of forcing and blanching is particularly worthy of attention. He says " the root of every perennial herbaceous plant contains within itself during winter, all the organizable matter which it expends in the spring in the formation of its first foliage and flower stems, and it requires neither food nor light to enable it to protrude these, but simply heat and water; and if the root be removed entire as soon as its leaves become lifeless, it will be found to

vegetate after being replanted, as strongly as it would have done, if it had retained its first position. These circumstances led me in the last winter, to dig up the roots of many plants of common rhubarb which I had raised from cuttings in the preceding spring, and to place them in a few large and deep pots, each pot being made to receive as many as it would contain. Some fine sandy loam was then washed in, to fill entirely the interstices between the roots, the tops of which were so placed as to be level with each other, and about an inch below the surface of the mould in the pots, which were covered with other pots of the same size, inverted upon them, being then placed in a vinery, in a situation where nothing else could be made to thrive on account of want of light, and being copiously supplied with water, the plants vegetated rapidly and strongly; and from each pot I obtained three successive crops, the leaf-stalks of the two first being crowded so closely as nearly to touch each other over the whole surface of the pots. As soon as the third crop of leaves was broken off and a change of roots became necessary, those taken from the pots were planted in the open ground, their tops being covered about an inch deep with mould. Should they perish it will be of little consequence, as year-old roots, raised from cuttings, or even from seeds sown in autumn in rich soil, will be found sufficiently strong for use. The heat of the hot bed, a kitchen or other room, and on the approach of spring, probably at any period after the middle of January, a cellar will afford a sufficiently high temperature; and the advantages in all cases, will be that of obtaining from one foot of surface as much produce as in the natural state of growth would occupy twenty feet. —(*Domestic Gard. Manual.*)

USE.

All the varieties are cultivated for the petioles of the root leaves, which are first peeled and then made into tarts and pies in a similar manner to gooseberries, for which purpose the Hybrid variety (*Rheum Hybridum*), affords the most abundant supply.

ROAD MAKING.

BY P. SKENE, ESQ.

Stone, wood, and iron, are the materials principally employed in making and maintaining roads. It may be noted, that, the art of making stone roads is reduced to fixed and certain principles, just as they are beginning to be superseded in use by roadways of iron. In countries newly peopled, wood, if at hand, is the material first employed in road-making. Trees cut up into pieces as long as the intended width of road, then split and laid with the flat surface downwards, make, upon any thing like even ground, a road capable of bearing any load that can be placed on a carriage; and of lasting for some years if the trees are well grown. Roads of this sort, have got the name of CORDUROY in some parts of North America; and when resting on marshy ground have something of the pliability of that well-known covering; for they sink and rise as the load or carriage passes on. The use of iron for road-ways is one of the consequences of the abundance of iron ore, with the coals and steam-power of this Country. Some attempts at paving streets with iron blocks have been abandoned, and mere tracks of iron for the wheels of carriages seem sufficient for all the purposes of travelling. By some it is proposed to suspend these tracks above the ground, but we shall not enter farther into this part of the subject of road-making, as it is not likely to be so practically useful to our agricultural readers, as the consideration of making and maintaining STONE-ROADS.

The durability of roads has always been a matter of great care to the road-maker, and roads made by the state with an immense outlay, attest at the distance of many centuries, the value attributed to this quality. Too much, perhaps, has been expected in many cases from great solidity of foundation and accumulation of materials on a road. Now it is generally understood that completeness in the structure of a road, is the *first* of a *series* of efforts which must be uninterrupted as long as the road is expected to yield its fullest amount of usefulness to the public. This conclusion is quite in unison with the nature of a road as it is expounded by one of our greatest artists in this way. Mr. Mc. Adam says, to the President and Board of Agriculture, "It is the native soil which really supports the weight of traffic, while that is preserved in a dry state, it will carry any weight without sinking, and does in fact carry the road and the carriages also. This native soil must previously be made quite dry, and a covering impenetrable to rain, must then be placed over it, to preserve it in that dry state."

Broken flints are allowed to be the best common material that can be employed to form the covering required, and under the pressure of a constant traffic may be kept impervious to rain without exceeding nine inches in thickness.

Ten cubic yards of well-broken * flint, will give a covering eight inches thick to a

* Well-broken: i. e, broken so as not to exceed 2 inches in any dimension.

road that is 24 feet wide, for the length of one rod, pole, or perch. The width of every cart-way leading to a market-town is directed by the 13. Geo. III. to be at least 20 feet; two waggons can pass on 14 feet of hard road. Whin-stone and the harder lime-stones well-broken answer nearly as well as flint, but most of the sand-stones are too easily triturated to be a fit covering for roads where there is much traffic. In the form of the covering no more convexity is beneficial than just sufficient to let water find its way to the side drain, watercourse, or water-table, as it is called in the Acts of Parliament. It is frequently necessary to have a grating in the water-table to allow the surface water to descend from the road into a ditch on the same, or on the opposite, side of the road. In the latter case, it is best to make a cross-drain under the road, circular or tunnel shaped, and it should have facings of brick or stone.

Level grounds are most favorable to draught, and steep hills should be avoided, by making the road circuitous in a moderate degree; Mr. Edgeworth (Essay, on Roads and Carriages,) observes, that "slight and short alternations of rising and falling ground are serviceable to horses moving swiftly, the horses have time to rest their lungs and different muscles; and of this, experienced drivers know well how to take advantage." Few things are more injurious to a road than over-hanging trees, on the side of the sun especially.

The constant attendance of a man for every four or five miles is necessary in all but the summer season, to scrape off mud in wet weather, and the soil or clay usually brought by waggon wheels from the adjoining fields and ways.

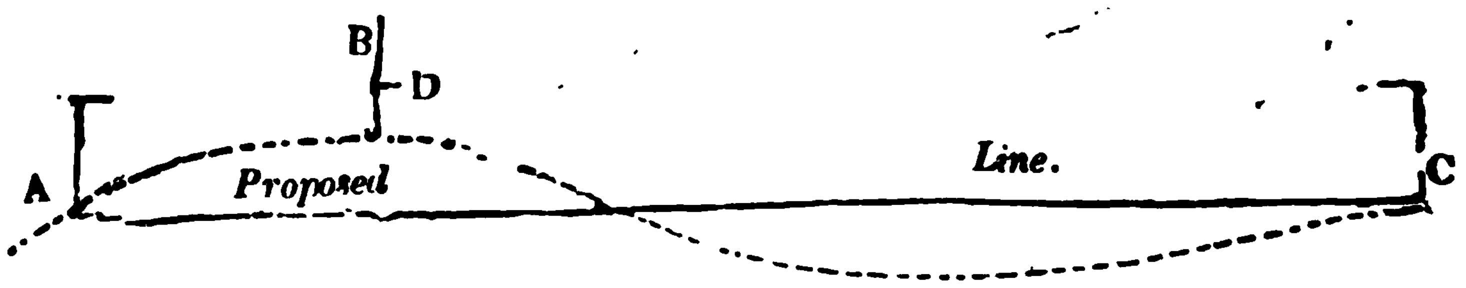
The annual cost of maintaining stone roads varies from 20*l.* to 110*l.* per annum. Roads are repaired by laying on new material, or re-laying the old, which may have been lifted and skreened; and the fittest time for doing so, is generally from October to the setting in of frost.

The pick-axe and shovel, an iron toothed rake, bushel basket and breaking hammer, are the implements most wanted by the men employed in maintaining a road, and these should be active, able bodied men, paid every week or fortnight, in most cases according to the quantity and description of work performed.

The common price of breaking flint is from 6*d.* to 9*d.* a yard, and some of the harder lime-stones are broken at the rate of 1*s.* 6*d.*, as in the Parishes of Waldron and Heathfield in the County of Sussex, this year, 1830.

When a road-way is cut through the top of a hill, it is requisite to give the side banks all the slope, at which different kinds of soil or earth, will stand the effects of weather, without encumbering the road-way; a slope of five feet horizontal, to four feet perpendicular will be enough for common soils. Some clays require more slope, and rocky soils generally less.

The following easy method of taking down a hillock on an inclined plane of road, or lowering a summit, is offered to the reader, by an old officer of the Turnpike roads in part of Sussex.



To discover how much a hill requires to be cut down to bring it to an inclined plane or to a level with the other part of the road. First fix on some point of the road as at A. setting up a stick five feet high from the surface; then let an assistant hold up another stick, five feet high, on the summit of the hill, as at B. having a piece of paper sliding up and down as at D. then place a second person with another 5 feet stick on the surface of the road, as at C. looking over his stick to the top of the stick at A., so that the paper at D. and the tops of the two sticks being in a line with each other, the length of the stick above the paper at D. will be the exact depth, the hill will require to be cut down.

ROSEMARY.

Rosemary (*Rosmarinus Officinális*), Diándria Monogy'nia, Linn.; and Labiátæ, Juss.

The Rosemary is a hardy evergreen shrub, a native of the south of Europe. There are three varieties cultivated:—

1. The Green or Common Rosemary, the hardiest and most generally cultivated.
2. The Gold-striped Rosemary.
3. The Silver-striped Rosemary.

Culture, &c.

Soil.

All the varieties prefer a light dry sandy soil, and a sheltered situation.

Propagated.

1. *By seed* sown either in drills six inches apart, or broadcast, and the seed well raked in.

2. *By slips or cuttings* from the young shoots of the same summer's growth, taken off in July at the time the lower ends of the shoots become a little hardened. The leaves should be taken off about half way up the shoots, and then inserted into the ground the same height, by means of a dibble about eight inches distant from each other. A shady situation should be selected and the cuttings watered immediately after their insertion. The waterings must be occasionally repeated until the cuttings have taken root. They will be well rooted by autumn, when they may be transplanted where they are finally to remain, but March or April appears to be a better period for removing them. They may be trained either with bushy heads, or against a fence in the fan manner.

Use.

1. The flowers and calyces form a principal ingredient in the distillation of Hungary-water.

2. The leaves and tops distilled with water, yield a thin, light pale essential oil of great fragrancy.

3. A weak infusion of the fresh leaves furnishes a pleasant substitute for tea, and is particularly agreeable to some dyspeptic stomachs.

4. Rosemary was formerly employed as a token of remembrance, and was accordingly worn at weddings; and it is probable that the same principle caused it to be used at funerals, for in some parts of England it is still distributed amongst the company, who throw sprigs of it into the grave.

ON THE ROTATION OF CROPS

By Mr. Hitchins.

The success of a farm very much depends on a right judgment of the course most proper to be pursued in the rotation of cropping the different soils, as their nature and quality so materially differ as to require not only a totally different course of management, but to be so cropped and managed as for each to work in away most beneficial to the whole. Consequently it is of the greatest importance that this point should be rightly understood, as without a proper judgment in this particular, the most persevering industry and economy will avail but little, except on some few of the best soils in the kingdom, or in large or populous towns where great quantities of manure are to be obtained; in which cases, though extra cropping might be pursued without injury, the same course under ordinary circumstances would not only be most unjustifiable, but would soon reduce the land to a barren unproductive state. Many very able and experienced agriculturists have repeatedly discussed this important subject in a perfectly intelligent manner, and have taken great pains in being as explicit as possible in detailing the result of their experiments under the various courses they have pursued, though in so doing, they have too frequently omitted the further equally necessary detail, the description and comparative value of the soils on which their experiments have been made, through which too many, calculating on the same results, though on soils of very inferior quality, and probably not at all adapted to the course pursued by the different writers, have gone precisely upon the same plan, and the result has been disappointment, vexation, and loss, when the practical facts, on which they started and afterwards continued, have been held up to derison as experimental theory, and at once condemned and abandoned; although by due reflection and a proper knowledge of soils and their capabilities, much advantage instead of loss might and would have been derived by the courses advised. Without, therefore, going into a tedious display of experimental results, which of themselves might be sufficient to form a volume from the pen of a long-standing practical agriculturist, I shall in as precise a manner as possible offer my opinions on the various soils, and the courses of cropping to be pursued on each, according to what I consider the best practical mode, not doubting but other of your contributors will throw some new lights on the subject much beyond my views. I will, therefore at once endeavour to point out the rotations which I consider best suited to different soils, as being the most economical and profitable course, commencing on the Broad Cast system. I will begin with clays, of which there are many descriptions, and some of the most sterile nature, while others are more pliant, and will readily yield to the operations of the husbandman, on commencing a tenantry on a clay farm

Stiff Clays.—All these soils I should recommend to be farmed on a five course tilth, com-

mencing with a fallow, to be well made, as recommended under fallows which should be also well manured with dung, marl, or lime, to be laid on and spread previous to the last stirring, by which it is better incorporated with the soil, or with lime and mould after the last stirring is completed. The second year wheat,—sow in the wheat seeds, which may be mowed or pastured the following year. Third, seeds. Fourth year, beans, to be kept well hoed, and if the season will allow, to be afterwards broad shared.

Rotation 2nd—Rotation on same land First year tares ploughed in as early as possible, and immediately after turned all over, which, feeding on the vegetable matter, will produce double the good effect, than if laid on stale sown lands without that previous preparation, being subsequently made a bastard fallow (see fallows) Second year, wheat. Third year beans, to be kept well hoed. Fourth year oats. Fifth year, seeds. By which courses, the land will bear wheat only twice in ten years; other white straw crops twice; beans once; seeds thrice; and twice fallow. These apply to the poorer sort of clays, and I am satisfied that a better produce will be obtained by this mode, than by taking more white straw crops, as any attempt to force these soils must be done at a considerable cost and ultimate loss to the occupier.

On clays of a better description—First Rotation.—First year fallow, well dunged over. Second year, wheat. Third year, beans. Fourth year, wheat. Fifth seeds.

Same land—Second Rotation.—First year, oats after seeds. Second year, fallow with vegetable crop of tares or buck wheat, ploughed in, and well limed over and managed as before recommended. Third year, wheat. Fourth year seeds. Fifth year, oats.

Where the drill husbandry is practised, as it can be, more profitably on this latter description of clays than the broad cast, the land may be maintained in equally good condition though more frequently cropped with corn; as the horse hoe not only keeps the land free from rubbish to which it is prone, but also renders it more pliable for each succeeding crop; and where judiciously effected operates as a partial fallow In which case I should recommend that the crops of wheat and pulse should be drilled sufficiently wide to allow of the hoe being constantly at work during the greater part of the summer, and although fallow may in that case be nearly dispensed with, I am of opinion that the occasional clear fallow assists the land materially, and though the quantity of straw may be equally abundant without, it will cause the produce of grain to be greater, and generally of better quality.

Drill System.—Under this system,—say first fallow—to get the land properly prepared for wheat, to be well manured. Second year, wheat drilled wide and kept well hoed. Third year beans, same. Fourth year, wheat. Fifth year, clover for hay, or to be saved for seed.

Second Rotation.—First year, wheat after seeds of first rotation, previously mowed and immediately after broken up for a bastard fallow. Second year, oats. Third year, beans. Fourth year, wheat. Fifth year, beans. By which rotations the land will produce wheat four times in ten years; other white crops only once; and pulse three times; seeds once; and fallow once only; but unless the hoeing is well conducted the broad cast system is to be preferred to drilling, unless judiciously managed. Some experienced practical men carry the drill system so far as to crop the land with wheat nearly every year, and though I have no practical knowledge of that fact I am told it is maintained to advantage, which is done by drilling very wide, and ploughing and keeping the land between the drills, deeply hoed. When the wheat of the succeeding year is planted on the land that was left between the drills and in like manner continued for many years in succession, but which system I consider might be practised with better success in bean lands thus managed, but this must wholly depend on the good management of the hoe. I am not an advocate for frequent sowing of oats on clays, for though in certain years they may turn out well, in general they will pay the least of any crop, though at the distance of time and manner I have described, a good crop both in quantity and quality may be fairly expected if put in when the land will work free, and has been well harrowed; as at no time should oats be sown if possible to avoid it, unless the land is dry enough to clear itself from the harrows, for when otherwise they are apt to come up but partially, and not ripen well together, besides which, if a dry time succeeds wet sowing, the surface of the land becomes hard, or as is frequently termed hide bound, when the crop is checked in its course, and cannot be rolled down, so necessary not only to admit of being properly mowed, but for the purpose of allowing the straggling part of the corn being raked together, but where lands of this description are attached to flock farms, and the feeding is required to be raised partly on these lands, the judgment of the owner must in that case direct such alterations in the above systems as the necessity of the case requires but generally speaking (unless so attached) the converting these descriptions of soil to the sheep husbandry, is attended with very little if any profit, and too often with considerable loss, as the working of sheep to advantage by folding requires considerable space.

Red clays.—The description of clays here alluded to, are those most frequently found on the hills of different counties in England, some of which are of a very stubborn adhesive nature, and mostly full of large flints. These soils, when intended to be made fallow, should always be ploughed up as early in the autumn as possible, and so lay during the winter, to receive the frosts, through which means it is afterwards easily got into good tilth, and by a proper subsequent rotation of cropping is so kept at much less cost than can possibly be effected by the old system of taking white straw crops; as the alternate course of green or vegetable crops will daily improve the fertilization of the soil, by destroying its adhesive powers.

These clays being generally found on flock farms, I would recommend the following course to be pursued, or as nearly so as circumstances will admit. First, to be early and deep ploughed in the autumn as a preparation for turnips, to be afterwards fed on the land. Second year, oats or barley, for though these lands appear unfavourable to the growth of the latter it is not often found to be the case. Third year, clover or winter tares. If the latter to be fed on the land, which should be immediately ploughed up, and made a bastard fallow for wheat. Fourth year, wheat. Fifth year, clover when tares in the third year, and tares where clover, which latter should be fed off, and immediately fallowed for rape, to be fed off in the spring. Sixth year, oats. Seventh year, peas, beans, or other pulse crop. Eighth year, Ninth year, seeds for sheep feed, or hay. Tenth year, oats.

Thus in ten years the land will produce

Wheat, twice		Total, 10.
Oats and barley, thrice		
Pulse crops	once	
For seeds		
Green feeding crops and seeds	three times	
Clover, once		

By this course, the land will every year become in a more mellowed state, will be annually worked at a considerable less expence, and be kept in much higher condition for the various corn crops, as it will not only have the advantage of extra ploughings in addition to the repeated feedings, but will also receive, as manure, whatever is trodden down by the sheep, by which it will constantly enrich and render the corn crops more productive, than if in the above period an extra crop had been taken, so that the rent, and seeding, with the labor and other charges, that would arise on such extra crop will be saved, to be carried to the credit of the stock, feeding off the green crops, and as drilling cannot on these soils be followed, they cannot, I am of opinion, be farmed to greater advantage.

Marls.—Of these there are various descriptions, though not so much in appearances as in quality, of which some are called clay marls, being of an adhesive and saponaceous nature, with a close retentive subsoil, requiring, when ploughed up in winter, to be laid in ridges, and the water to be well taken off by furrows, otherwise it is very untoward to work in the spring of the year. There is also another sort, of an equally close and adhesive nature, with an absorbent subsoil, consequently is much easier to be cultivated than the former; and a third that is light and dry, called chalk marl, which is of easy tilth, besides many intermediate ones; which as they nearly approach to one or other of the above the same rotations will apply to them according to their descriptions.

Clay Marls—These are of heavy tillage, but generally productive according to the labour and manure applied to them, and are well calculated for the alternate system of white straw, pulse, and green crops, when judiciously managed, and particularly when annexed to a flock farm, which is mostly the case, being found at the foot of chalk hills. The course of cropping I should advise, it being a wheat soil, would be as follows :—First year, winter fallow for early turnips, or rape, to be fed off by sheep. Second year, wheat. Third year, winter tares to be fed off and made a bastard fallow. Fourth year, wheat. Fifth year, beans. Sixth year, wheat. Seventh, clover. Eighth, wheat. Ninth, tares. Tenth, wheat. So that although wheat is sown under this system, every other year, by having a green crop between each, the condition of the land is fully maintained, though it is probable that wheat would not, after a long continuance of this system, be so productive as by changing its course. The following rotations would answer the object, and by some would be more approved, though I have known the above practised for many years, with the greatests success. If altered, say—First year, turnips. Second, wheat. Third, clover. Fourth, oats. Fifth, tares, to be fed off, and made a bastard fallow for wheat. Sixth, wheat. Seventh, clover. Eighth, wheat. Ninth beans. Tenth, wheat.

By this first course, the cropping of ten years, will stand thus

Wheat in ten years, five times	Total eight.
Pulse seed, one ditto	
Turnips and Tares, or Rape thrice	
Clover, one ditto	

By the second course, it will stand thus

Wheat in ten years, four times	Total, 10.
Oats, one ditto	
Beans, one ditto	
Clover, twice ditto	
Turnips and Tares, two ditto	

The second description of Marls.—Rotation as follows—First year, turnips. Second, wheat. Third, potatoes. Fourth, wheat. Fifth year, clover. Sixth, wheat. Seventh, tares to be fed off. Eighth year, barley. Ninth, seeds. Tenth, wheat; and will stand thus,

Wheat, in ten years, four times
Barley, once
Potatoes, once
Clover and seeds twice
Turnips and Tares twice - } Total, 10.

Dry or Chalk Marls.—Rotation. First year, turnips. Second, barley. Third, clover. Fourth, wheat. Fifth, rape. Sixth, barley. Seventh, seeds. Eighth, oats. Ninth, rape. Tenth, wheat; which, in ten years, will stand thus

Wheat, twice . -
Barley and oats, thrice - -
Clover, once - -
Pulse, once - -
Turnips and Rape, twice -
Seeds for sheep feed, once } Total, 10.

All these soils being well adapted to the drill system, may be kept in a perfect clean state, and thereby worked to the best advantage.

Loams.—These soils, particularly when dry, are of a valuable description, as they generally produce heavy crops, if well managed, being of a cool nature, many of which may be considered amongst the first class, and may be cultivated for wheat in frequent repetitions.

Dry Loams.—First year, turnips, cabbages, and mangold wurzel, or beet root. Second year, wheat. Third year, beans, drilled. Fourth year, wheat. Fifth year, potatoes. Sixth year, barley, or oats. Seventh, clover. Eighth, wheat. Ninth, tares. Tenth, wheat; and which in ten years, would stand thus

Wheat, four times -
Barley, once
Potatoes, once - -
Beans, once - -
Clover and tares, twice
Turnips, cabbages, &c. once } Total, 10.

Wet Loams.—Rotations. First year, cabbages. Second, oats. Third, clover. Fourth, wheat. Fifth, tares or fallow. Sixth, wheat. Seventh, beans. Eighth, oats. Ninth, cabbages. Tenth, wheat.

Or thus—First year, fallow. Second, wheat. Third, clover. Fourth, beans. Fifth, oats. Sixth, tares. Seventh, wheat. Eighth, beans. Ninth, wheat. Tenth, cabbages.

By first rotation of 10 years.

Wheat, three times - -
Oats twice - -
Beans, once - - -
Clover, once - - -
Green crops & fallow, three ditto } Total, 10.

By second course

Wheat, three ditto - -
Oats, one ditto - -
Beans, two ditto - -
Green crops, three ditto
Fallow, one ditto } Total, 10.

Hazel Moulds.—These soils are not only the most pleasing to work upon, as being free of tilth, but are adapted to any course of cropping, or general management, both for sheep feeding, and the growth of corn, or vegetable crops; and the course, I have pursued, is as follows, beginning with rye, on lands, intended for turnips the next summer, which keeps the rubbish down, and leaves the land in a mellow state; besides which it is a most valuable food food for sheep, after going from turnips, previous to the seeds being ready for feeding, particularly for ewes, with lambs, as it causes the milk to flow. It is also very convenient to save a small piece, to cut for the farm horses, before the other green food comes in, and will each come off in sufficient time to prepare the land for turnips, say—First year, turnips. Second, barley. Third, clover. Fourth wheat. Fifth, potatoes. Sixth, barley. Seventh, clover. Eighth, wheat; which, in eight years, will stand thus

Wheat, twice - -
Barley, twice - -
Clover, twice
Turnips, once - -
Potatoes, once - - } Total 8.

Sands.—Some of the best description nearly approach to hazel moulds, which are composed of loams and sands, and may be cultivated after the same manner.

Light Sands.—First Rotation. Rye, as directed on hazel moulds. First year, turnips. Second year, barley. Third, seeds for sheep-feed. Fourth, seeds. Fifth, oats. Sixth, turnips. Seventh, barley. Eighth, potatoes. Ninth, rye, for seed. Tenth, turnips.

Or thus.—First turnips. Second, barley. Third, clover. Fourth, wheat. Fifth, potatoes. Sixth, rye for seed. Seventh, turnips. Eighth, barley. Ninth seeds for sheep feed. Tenth, oats.

By the first, it will stand thus

Wheat, none	Total, 10.
Barley, twice	
Oats, once	
Rye, once	
Turnips, three times	
Potatoes, once	
Seeds twice	

By the second, thus.

Wheat, once	Total, 10.
Barley, twice	
Oats, once	
Rye, once	
Turnips, twice	
Potatoes, once	
Seeds, twice	

As these lands are subject to blighted crops of wheat; and if not so, are generally very dificient both in quantity, and in quality. I would not therefore advise the sowing of it on these lands, but on those of a better discription, unless where a farm principally consists of lands of this description; in which case, it generally proves best if sown after clover. All these foregoing soils may be drilled to advantage.

Gravels.—Many of these are of a very wet, cold, and hungry nature; whilst others are equally hungry, but dry, and disposed to burn, in hot weather. There are, at the same time, others of a good holding quality, from partaking largely of loam, and may be managed in the same way.

Wet Gravels—Require to be managed in such a manner as that the wheat crops may be got in well and early, otherwise the seed will lay a long time in the land before it vegetates, and not unfrequently rots. The rotation, as follows, appears to answer best upon it. First year, fallow. Second, wheat. Third, tares fed off. Fourth, barley. Fifth, clover. Sixth, wheat. Seventh, beans. Eighth, oats. Ninth, clover. Tenth, wheat.

Rotation in ten years.

Wheat, three times	Total, 10.
Oats and barley, twice	
Beans, once	
Clover, twice	
Tares, once	
Fallow, once	

Dry Gravels.—First year, turnips. Second, oats. Third, seeds. Fourth, seeds. Fifth oats. Sixth, turnips. Seventh, barley. Eighth, clover. Ninth, wheat. Tenth, pease or tares.

By this, in ten years.

Wheat, once	Total, 10.
Barley and oats three times	
Pease, once	
Seeds, three times	
Turnips, two ditto	

Chalks.—These soils, or, what are called chalk hills, vary very considerably, both in nature and quality, and consist of loams, wet and stiff clays, and black and red sands, on a chalk substratum, without any intermixture of chalk, and others nearly all chalk; but as these are generally lands on which large flocks of sheep are kept, they are rendered subservient to their use, and thereby become much more productive than they otherwise would be; which goes far to confirm the advantages of more generally cultivating green crops. The usual mode is as follows

Best quality.—First year, fallow for rape, to be fed off. Second year, wheat. Third year, barley and oats. Fourth, seeds for hay and pasture. Fifth, oats, (second rotation.) Sixth, turnips or rape. Seventh, wheat. Eighth, tares. Ninth, barley. Tenth, seeds; which in ten years, will stand thus

Wheat, twice	Total, 10. Some of these soils, however, in particular situations are sown more frequently with wheat
Barley and oats three times	
Seeds, twice	
Turnips and rape twice	
Tares once	

Chalk Hills—Second quality.—First year, rape. Second, wheat. Third, seeds, for sheep feed, Fourth, oats. Fifth, turnips. Sixth, barley. Seventh, clover. Eighth, wheat. Ninth, barley. Tenth, seeds for sheep; thus in ten years

Wheat, two years	Total, 10.
White crop, three years	
Green crops, two ditto	
Seeds, three ditto	

Thin Chalks.—First year, rape and turnips. Second, barley. Third seeds. Fourth, seeds. Fifth, oats. Sixth, rape. Seventh, wheat, Eighth, seeds. Ninth, oats. Tenth, rape. Thus in ten years,

Wheat, one year -	Total, 10.
Lent corn, three ditto	
Green crops, three ditto	
Seeds, three ditto -	

a proportional part being first deducted for saintfoin hay, or rape, or turnips. Second, barley, or oats. Third, clover. Fourth, wheat. Fifth, tares. Sixth, barley. Seventh, seeds. Eighth, oats. Ninth, rape. Tenth, barley. Thus, in ten years,

Wheat, one year -	Total, 10.
Lent corn four years	
Green crops three years	
Seeds two years - -	

In thus giving my hasty opinion on the best course to be pursued in the rotation of crops, I take it for granted that proper proportions of manures, and of good quality, will be laid on the land, as circumstances may require; the first practical part of farming being to keep land clean and well manured, as the basis of all future proceedings; nor can any course of rotations be laid down, but circumstances will occasionally alter; but of this I am thoroughly convinced, that on the generality of soils, the husbandman, who follows up the system of green, and occasional pulse crops, between his white straw crops, and who keeps the sorts of each as far distant from that with which it was before sown as possible, will find it best answer his purpose, and be the means of allowing him to render up his farm to the proprietor in a condition that will do him credit; and I feel also assured, that the time will arrive when the agriculturist will find it so much to his advantage to pursue the system I have pointed out as to render any compulsory covenants unnecessary. I well recollect when a clause was first introduced into leases, (I believe by a most intelligent gentleman, John Hoper, Esq.. of Lewes, then agent to different noblemen and gentlemen) restricting the tenants from sowing more than two white straw crops in succession, by which an alarm was instantly raised that no tenant could long afford to pay his rent, under such restrictions, which, however, is now generally adopted by choice; and I doubt not, but it will be found that by introducing a green crop between each white straw crop, that sure profit will be realized, and the land maintained in better condition than by any other system. However, I am aware that there are no rules without exceptions; and I know that, on the South Down farms, barley is generally found to answer both in quantity and quality better, if sown after wheat (particularly, if the wheat was sown on a clover ley) than if sown after rape, or turnips. Nor do my observations apply to rich fresh broke up marsh lands, which, from their active nature, require checking and constant cropping, to prevent the straw from being over-grown, and falling, which must be drilled to be kept clean, and then may be constantly cropped, for a number of years. Nor will my observations apply to the fen districts. In discussing this subject, I have endeavoured, plainly to state the views I entertain as to the course of rotations that should generally be pursued in the soils I have enumerated, without giving the results of any experiments, wishing to avoid any remark that might tend to mislead, or enter into any analysis of the earth, which I leave to more competent hands, but offer these, my views, of the subject in the utmost sincerity, and in the hope that some part of them, may be useful to those who may be seeking after practical information in agriculture, assuring them whatever error I may be labouring under, they arise from want of better information, which I sincerely hope, may, and will be speedily improved upon, though the encouragement to agricultural improvements are at the present period of so disheartening a nature.

RUE.

Rue (*Rúta Gravéolens*), Decándria Mongy'nia, Linn.; and Ructáceæ, Juss.

Rue is an evergreen under-shrub, characterised by its peculiarly strong scent:—

Culture, &c.

SOIL.

This shrub will grow in any common garden soil, but prefers a shady situation.

PROPAGATED.

1. *By cuttings or slips* of the young shoots taken in March, April, or May, They should be watered immediately after planting, and occasionally afterwards, till they have taken root.
2. *By seed,* sown in the spring.

PLANT.

The plant should be cut down occasionally, which will furnish it with plenty of leaves

and young shoots. It should never be allowed to run to seed unless they are wanted for propagation.

USE.

The leaves are sometimes employed as a medicinal simple, and are also given to poultry having the croup.

RYE.

Rye (*Secále Ceréale*), Triándria Dygy'nia, Linn.; and Gramíneæ, Juss.

There are two varieties of this grain, the winter and spring; the former is the most hardy, consequently is more frequently cultivated than the latter, but the spring variety may sometimes be sown to advantage.

Culture, &c.

SOIL.

This grain may be cultivated on an inferior soil to that chosen for wheat, but the light dry sandy soils are considered by most experienced farmers to be the only ones, it can be grown upon to advantage, as such soils are not so well calculated for any other grain, as wheat, barley, &c.

2. *Preparation of the Soil.*

The land when cultivated with rye requires to be in good tilth and perfectly free from weeds. If it is intended to stand for a crop it is desirable to sow on a fallow; but if intended to be fed off with sheep, one ploughing will be quite sufficient. Manure is seldom applied unless the land has been very much impoverished by other crops, and even in that case, it would be more advisable to put in the seed without manure, feeding it off with sheep, and reserving it for a turnip or other green crop that may succeed it. This grain succeeds best after pease, clover, or early red turnip.

PROPAGATED.

1. *By seed,* sown either broadcast or in drills, either in the autumn or spring, though the winter-seeded fields are generally most bulky and most productive.

2. *The quantity of seed.*—If to stand for a crop, from two to three bushels per acre will be sufficient; if for feeding off, three bushels and a half, and even more, will be required, as for this purpose it cannot stand too thick upon the land.

After-culture.

1. *If this crop is intended to stand,* it is necessary to keep it perfecty free from weeds, but if for the purpose of feeding off, this culture will not be requisite.

2. *Feeding off.*—This should be done before the blade becomes too hard and woody. The earlier, however, it can be fed off the first time, the better and stronger will the second shoots throw out; but in all cases it should well cover the ground before the sheep are turned in.

3. *The harvesting, thrashing, &c.*—are in every respect similar to wheat.

USE.

1. This grain affords a meal next in value to that of wheat, and is used either alone or mixed with wheat, for bread and gingerbread.

2. Rye in its green state is used as food for sheep, and is considered to promote a greater flow of milk in ewes; independent of its being early, and at a time when no other artificial green food can be raised for them. In feeding off, the sheep should be limited to a certain portion at a time, by means of hurdles, which will not only prevent a great loss of food, but will allow time for that which has been fed off to become fresh, while the first crop is being eat down.

3. The straw is preferred by some for thatching and for litter; it is also used by collar makers, and employed in Dunstable work.

4. In some districts it is a custom to sow the headlands of wheat fields with rye, from an idea that it will keep off blight and mildew.

SAGE.

Sage (*Sálvia Officinális*), Diándria Monogy'nia, Linn.; and Labiátæ, Juss.

Sage is an evergreen under-shrub, rising about two feet high, a native of the south of Europe. There are four varieties :—

1. The Common or Red Sage.
2. The Green Sage.
3. The Small-leaved Green or Sage of Virtue.
4. The Broad-leaved Sage.

Of these the red and green are the most in favor with the cook, as being most agreeable in flavor; but the small green is considered best for decoctions, and the broad-leaved the most efficacious for medicinal purposes.

Culture, &c.

SOIL.

The sage will grow in any common garden soil, but the situation should be shady.

PROPAGATED.

By Cuttings.—All the varieties may be propagated by slips or cuttings, either of the preceding or the same year's growth. The outward shoots are to be preferred, and should be cut off about six inches long, and the lower leaves detached; preserving the upper ones entire. It is an old saying—

"If planted in May,
They will grow every day,"

and if planted in April or June they will no doubt do the same. They should be planted half their depth, six inches apart, and watered. They will soon strike root and advance in growth, but if any spindle up into flower-stalks they should be cut down, and the plants will shoot out strong and stocky for use the same year.

After-culture.

In July the plants, both young and old, should be formed into regular heads by cutting away all irregular shoots and decayed flower-stalks. They must be kept clear from weeds by hoeing the ground amongst the plants. A new plantation should be made every two, three, or four years, as may appear necessary by the plants becoming naked and decayed.

In gathering sage for use the young side and top shoots should be cut neatly off, being careful not to cut them too close, and particularly towards winter.

USE.

The leaves are used in stuffings and sauces, and to improve various articles of cookery. It is sometimes used as a substitue for tea, and likewise combined with vinegar and honey, forms a domestic gargle, much employed in inflammatory affections of the throat.

SALT.

The use and abuse of common Salt, as a manure and as a Condiment for Cattle.

BY CUTHBERT WILLIAM JOHNSON, ESQ. of Great Totham.

AUTHOR OF AN ESSAY ON THE USES OF SALT IN AGRICULTURE AND HORTICULTURE, &c.

AND

OBSERVATIONS ON THE EMPLOYMENT OF SALT IN AGRICULTURE, &c. &c.

The employment of common Salt as an Agricultural Agent, has, during the last eight years, been gradually extending, and from an annual consumption of scarce five tons per annum, has rapidly increased from year to year, till at length, several thousand tons of impure salt of all kinds, were last year (1829), sold for agricultural purposes.

Salt, it is true, has of late years been very extensively employed by agriculturists as a fertilizer, but still more considerably as a condiment for live stock. There is scarcely room for experimentalists to blunder in the last application, but as a manure, its employment is endangered by many erroneous trials and by as many empirical processes and ill conducted experiments, to give an instance or two of the blunders of both teachers and disciples.

As soon as the duties on salt were repealed, reference was made to all the old agricultural writers, for information on the subject, as a guide for modern farmers, and it was presently discovered by a late eminent writer, that Sir Hugh Platt in his "Jewel house of art and nature," published in 1658, had recorded a valuable trial upon *a slip* of grass land, at Clapham, upon which plot a bushel of salt, had produced astonishing and permanent results by killing the old grass, and making the soil clean, for a fine sweet turf which sprang up in the succeeding autumn.

This experiment was immediately announced to the world, with the blundering alteration of the transcriber, that one bushel of salt *per acre,* was the correct quantity for the farmer to apply, and that at a consequent expense of about sixpence per acre, all the good results of salt as a fertilizer, were procurable.

The enlightened Agriculturists of England too, when they laughed at this ignorant blunder; were by no means infallible in *their mode* of trying their early saline experiments, one farmer in our own neighbourhood, tried it immediately upon a potatoe crop, and to be quite sure of the potatoe sets deriving all possible benefit from the crystals of salt, he actually had a handful of salt, *put with the sets* into the holes made by the dibber;—" and says our valued correspondent, J. Walker, Esq., of Howlish Hall, Durham, we can make agricultural blunders in the North, quite as good as any thing you can manage in the South, for a neighbour of mine, who salted his turnip land, actually *drilled the salt and seed* into the ground together!!

I could add to this laughable list, hundreds of others, and that too by men who ought to know better than to judge of any agricultural subject, by experiments carelessly began, neglected during their progress, and generally forgotten towards their conclusion.

The mischief too does not terminate, with such blundering trials; for these experimentalists not only are persuaded of their own infallibility, but they prejudice others against a more correct and patient examination, for my friend, the Potatoe-grower is quite sure " salt does no good to Potatoes" and Mr. Walker's *experimentalist*, thinks of his salted Turnips, " which never come up at all" whenever salt as a manure, is mentioned in his presence.

The investigator who is desirous of employing salt in agriculture, should, by all means read what others have done before him. If he is a *scientific* agriculturist let him peruse the *chemical* experiments in the first chapter of Johnson's Essay on the Agricultural uses of Salt; third edition, but if he is entirely a practical farmer he will prefer the experiments of those practical men, who have illustrated that work by the details of their invaluable labors, and he will there find detailed in their own words, the researches of Messrs. Brooke and Ransom, in Suffolk; Messrs. Baynes, Butler, Wood and Challis, in Essex; Mr. Ross, in Kent; Mr. Burrell, in Sussex; Mr. Long, in Hampshire; Mr. Benett, in Wiltshire; Mr. Sinclair, in Bedfordshire; Mr. Hollingshead, in Lancashire; Messrs. Sickler and Hoblyn, in Cornwall; Mr. Hogg, in Middlesex, Mr. Collyns, in Devonshire; Mr. Walker, in Durham, and a host of others.

That salt is alike beneficial to all kinds of land, and at all times, is an assertion too absurd to need refutation, for such an universal property belongs to no other manure; even chalk or lime will not suit all soils. Stable manure may be employed without benefit.

When chalk is applied to some soils, years must elapse before its good effects are visible to the farmer; " and yet," said the late eloquent Lord Erskine, " chalk, which has caused to start into life the most inert soils, is just nothing as a manure compared with salt."

And, let me ask, what would have been the fate of chalk as a manure, had its early advocates decided upon its merits, without first employing that patient spirit of investigation so especially necessary in all agricultural pursuits?

Would chalk, or gypsum, or lime, or bone dust, ever have been generally employed as a manure, had their advocates been infected with a spirit of impatience, and proud contempt of the experiments and rules of those who went before them? Chalk and gypsum had their opponents; they too, had to encounter ignorance in all shapes; but they triumphed at last, and so will the advocates of salt.

It is not intended to be concealed, that salt has been employed sometimes with detriment to the crop under experiment, often without any effect; yet these are no proofs even of its inutility. Some soils require it to be applied in the autumn, others in the spring; some crops are most benefitted by having it applied long previous to their insertion, others at that immediate period. Neither let any farmer imagine, because it is beneficial to his light soils, that it cannot be equally so to more tenacious ones; its gently moistening powers render the first more fertile, the latter friable. and more open to every agricultural operation in the dryest seasons. On the richest soils it may be employed with advantage, were it only to destroy the predatory vermin with which they more than usually abound. Those who have studied the subject most, and witnessed the greatest number of experiments, must agree in considering that there is no soil or crop that will not, under some circumstances, be benefitted by the application of salt; it cannot be otherwise, but in the immediate vicinity of the ocean. The misfortune is, that no enlightened agriculturist has grappled with its investigation, with the patient determination to establish its true worth; the Drill Husbandry has had its Coke: the Grazing System its Somerville; but salt is still without its demonstrator. The combined exertions of the many may obviate this deficiency. Let every farmer but institute and carefully pursue an experiment, and let him communicate it to the public, whether favorable or otherwise, in all its details; and the true value of salt as a manure, will soon be established.

It is scarcely necessary to add, let no one view the subject as of small importance; say nothing of it in a scientific point of view, that cannot be unimportant, with which is connected one of the staple manufacturers of the country, which involves the cheapest and most portable manure within the reach of the agriculturist. Let no one think he can do nothing in furtherance of the research; the most ill directed and unsuccessful experiment serves at least as a warning, a beacon to others; a judicious one, especially when crowned

with success, bears with it the inestimable gratification that a benefit is conferred upon mankind! The pleasure that always accompanies the illustration of truth.

In all these researches, the agriculturist must not forget that it is *comparative* experiments alone that are of value, as guides to future operations. For this purpose, it will be advisable that the experiments should be—

1st. On as bold a scale as possible; and on different soils.

2ndly. That *part of the field only* should be salted, and the produce on both *salted* and *unsalted* soils carefully *measured* or *weighed*

3rdly. That salt should be applied in more than one proportion, and at different periods; as a fortnight before seed time, at the time of sowing, and when the corn is well out of the ground.

4thly. Its use when combined with other manures, as soot, lime, bone-dust, &c. should be, if possible, ascertained, as the good effects produced by a mixture of salt and soot, are known to be very great. And where the Fossil or Cheshire Salt is used as a top dressing for light dry soils, if the salt is mixed with an equal weight of lime, and suffered to remain in a damp place (as a cellar) for a month before using, it will hense be rendered still more absorbent of moisture.

This is a fact of much importance to the light land cultivator; for the lime forms when mixed with Chloride of Soda, a very moistening substance, which a correspondent at Manchester (Frederick Fincham, Esq.) thinks highly valuable as a fertilizer.

This too accords with the opinions of my valuable correspondent, W. Collyns, Esq, of Kenton, in Devonshire, Author of "Ten Minutes advice on Salt," who is decidedly in favor, of employing, as a manure, the common Salt made from Sea Water, which variety always abounds with the *Chloride of Lime.*

5thly. Its use when applied to fruit and other trees, is well worthy of the most careful examination. A Correspondent in Norfolk, (W. Withers, Esq. of Holt,) is now trying it upon some timber plantations.

I would implore, the old English farmer's attention to the following facts, for the sake, not only of himself, but of our country; and if he shall be led to try the very smallest experiment with this substance, (and an acre may now be manured with it for ten shillings,) attending carefully to the directions of those who have gone before him; he will assuredly enrich, not only himself, but the country which gave us birth.

It is needless to dwell upon the widely diffused presence of salt, or upon the inexhaustible mines of it, with which our country is endowed; all waters—all soils contain large or small traces of it; and there have not been wanting some philosophers who have contended that even rain water contains common salt, but they have perhaps mistaken one cause for another; they have given as a chemical fact, that which may be in reality a mechanical effect; the spray of the sea having, during storms, been carried even one hundred and twenty miles in land, as M. Lœwenhoek, a Dutch Philosopher, has very well demonstrated.

In the first ages of the world, salt could not have remained long unnoticed or unemployed; its inhabitants must have soon remarked that the animal tribes had a strong predilection for this saline mineral; as even the thoughtless savages of North America make the observation, that near to their salt licks, their game always abounds; and the Laplanders, to this day, bring their rein deer periodically to the sea side, for the sole purpose of drinking the salt water.

The briefness of some of the writers of the Old Testament has often and very justly been regretted. I cannot but consider as another object for this feeling, the short account given. of the healing by Elisha, of the waters of Jericho, by means of salt, (2 Kings, chap. ii ver. 19, 22.)

It was the universal custom among the eastern nations, to irrigate their lands; and if the waters in the neighbourhood were unfit for this purpose, the soil, from the heat of the climate, was rendered unproductive. This appears to have been the case at Jericho, and to heal them, Elisha through in salt. The smallness of the quantity added, could, in the natural course of things, have had no influence; whether he directed it to be often repeated is not stated, nor is it material as regards the observations I have to make upon it.

The agent employed in these miracles had usually a typical meaning, or conveyed useful instruction—thus, when Moses healed the waters of Marah, (Exodus, chap. xv. ver. 25.) he threw in the branch of a tree; which, although we are not told so there, yet afterwards is said (Ecclesiasticus, chap. xxxviii. ver. 5,) to have been done to inform the people of its sanative qualities.

Salt had been held up as the cause of barrenness, and had been sown by Abimilech, with that typical representation, over the ruins of Sechem, (Judges, chap. ix. ver. 4, 5,) it was now employed perhaps as a means of conveying the information, that in small quantities it produced a very different effect. I have thus early been induced to remark upon observations in the Old Testament, because I know that these, the earliest notices of salt being applied to land, are in the hands of every farmer, and are very justly looked upon, by him, as volumes from whose statements there is no appeal.

That salt was very early applied as a manure in the East, we have abundant testimony. "Salt" said our Saviour, in one of the addresses, to his disciples, "is good; but if the salt

have lost its savor, wherewith shall it be seasoned? it is *neither fit for the land, nor yet for the dunghill*, but men cast it out." St. Luke, chap. xiv. ver. 34.

In the works of the early writers upon rural affairs, we find little notice of salt as an agricultural agent. Virgil reprobates a salt soil; for he had probably observed, that where the sea overflowed its usual boundaries, vegetation was completely destroyed, and the poet paused not to consider what would have been the result had any other manure been applied in a similar excess—for instance, if an ocean of chalk and water had inundated the same land, and the suspicion that a small quantity might have quite an opposite tendency, was an idea too refined even for the court of Augustus. He says, however, that it must not be a salt soil; and in that conclusion every one will agree with him. He commends the use of salt for cattle very highly; as does Cato, the earliest of the writers upon rural affairs, whose writings have escaped us. Cato says, "sprinkle your best straw with salt, then to serve it for hay."

Lord Bacon, who died in 1626, recommends its use for the garden.

Sir Hugh Platt, in 1658, bears testimony to its value for grass lands.

Frederic Hoffman, in 1742, and Dr. Brownrigg, in 1748, celebrated its importance as a condiment for cattle.

Amid, therefore, such an almost universal conviction of men of all ages and countries, as to the value of salt in agriculture, it may be perhaps enquired, why its general use has been so much prevented; one reason is sufficient in reply to such an apparent objection.

From the days of King William the Third, to the year 1824, salt had been burthened with an increasing tax, hampered with restrictions, overwhelmed with prohibitions; but still, in spite of these burthens, the use of salt in agriculture never entirely ceased. Every ostler knew that it was good for his horses. The farmers of the West of England still used sea sand, as their ancestors did before them; for that was not under the controul of the excisemen—that could not be warehoused.

The farmers in the neighbourhood of Padstow Harbour, annually employ nearly 54,000 single-horse cart loads of sea sand, and they are so convinced of the superiority of this salted sand, that they prefer, says Dr. Paris, "sending four or five miles to the shore to obtain this calcareous sand, which has salt in it, although, at much less expense, they might procure drifted sand, which does not contain salt, at their own doors.

Some farmers feel a great difficulty in believing that salt can be a manure, but let such be assured that almost all the most valuable manures are actually salts. Need the intelligent farmer be told, that chalk, carbonate of lime, is known by every chemist to be a salt, and must he be told that gypsum (sulphate of lime) is another salt.

The fate of gypsum well illustrates the progress made and making by salt as a manure in this country. When gypsum was first proposed as a manure, it was first laughed at and rediculed, especially by those who knew least of its properties and powers; and then it was used for every thing and for every crop, in defiance of the remonstrances of its early advocates, who warned the agriculturist that it operated only as a *direct food* for some plants, and that only three cultivated grasses contained it in sensible proportions—Lucern, Saintfoin and Red Clover, to which may be added the Turnip. The failure, therefore, of gypsum, in the first instance, was general and complete; time, however, enlightened its enemies, for time polishes even a block of granite, and gypsum is now generally and scientifically used for these four crops only, for it does not, like salt, possess properties useful to vegetables of all kinds.

Phosphate of lime is another salt extensively employed in agriculture; for bone-dust contains of it 55 per cent. Every tiller of the earth knows that the ashes of the soap-boiler abound with salts of various kinds, both of soda and potash.

And let me ask, what but the presence of twenty different salts (common salt among the rest) makes the urine of animals so valuable as a fertilizer?

And what would be the value of the largest dunghill, so justly splendid in every farmer's eyes, without the presence of these salts? would it be of more value than so much tanner's bark or peat? and does not every farmer know what Lord Meadowbank has so ably illustrated, that even inert peat becomes a manure by being putrefied and mixed with the salts of the dunghill?

I have elsewhere endeavoured to prove that salt is a manure to plants in six different ways, and I refer the farmer to my Essay on Salt, for the proofs and illustrations. 1. By *promoting* in *small* proportions, putrefaction. 2. By destroying weeds, grubs, &c, 3. As a constituent, or direct food. 4. According to Dr. Darwin and Dr. Priestly, as a stimulant to the absorbent vessels of plants. 5. By preventing injury from sudden transitions in the temperature of the atmosphere. 6. By keeping the soil moist. In this article however, I have no intention of entering into such detail, nor is it perhaps requisite, though always useful, that the farmer should in every case understand the chemical process he is daily witnessing or the laws by which he cultivates the earth.

WHEAT.

Salt, it should be remembered, *rarely causes the wheat plant to grow larger or taller*, but it fills up the ear better, and brings the weaker plants forward. We have it on the authority of Mr. Sinclair, that "salt appears to lessen the produce of straw, and increase the weight of grain." We have never been able in our experiments, or any we have witnessed, to see

any increased quantity of straw, even in cases where there was an increased produce by means of salt, of six bushels of wheat per acre.

We cannot enforce this too much upon the attention of the agriculturist. Let not the farmer be deceived by appearances; let him have the salted and unsalted portions, at harvest time, carefully separated and examined by weight, if the plots are small, or measure will answer if extensive. A few square roods, or even yards of each, will be sufficient; and we have no hesitation in saying, that he will find the result highly in favor of salt. But if, on the contrary, after having carefully applied salt to *half* of the field, he judges at harvest time merely by his eye, in such an unfortunate case, let us request of him, for his own credit's sake, not to mention *his experiments* upon salt manure; how carefully he tried it, and how complete was its failure: let him be assured that such modes of investigation, though very common, are worse than useless to the agriculturist: are marks of obstinacy and presumption to be excused only on the plea of ignorance.

Let the Salt be applied some time before sowing the seed, not less than ten and not more than twenty bushels per acre.

In our own experiments upon a light gravelly soil, at Great Totham, in Essex, the use of twenty bushels of salt per acre, (in 1819), produced an increase of five bushels and a half per acre.

The following statement of the result of some trials in 1820, will shew how important may be the result to the country at large, by its judicious application. I regret that incessant employment of a very different nature has hitherto prevented my continuing these experiments.

PRODUCE PER ACRE.	Bls.	lbs.
No. 1. Soil, without any manure, for four years	19	26
2. Soil, manured with stable dung to the previous crop, (Potatoes)	26	[illegible]
3. Soil with five bushels of salt per acre, and no other manure for four years	[illegible]	[illegible]

The soil light and gravelly.

The testimony of a plain Essex farmer may have some weight in corroboration of my own even with the most suspicious. "The soil," says Mr. James Challis, of Panfield, "which I described to you to be of rather a loose hollow description, had a dressing of salt put on it in November after the wheat was sown, about fourteen or fifteen bushels per acre; it produced at the rate of six bushels per acre more than that which was not dressed, and it may be stated to be 1*l*. per load of forty bushels better in quality."

Another Essex farmer, the late Mr. Baynes, of Heybridge, had his doubts removed by the result of the following experiment—the soil "a sandy clay."

PRODUCE IN BUSHELS.	Per Acre
Soil dressed with 15 loads of stable dung per acre	17[illegible]
Soil dressed with 14 bushels of salt per acre, immediately after the seed was sown	[illegible]

We select these statements from a host of others, which the unsatisfied farmer will find in the work we have just recommended, because these experiments were made by *men prejudiced against the trial of salt as a manure: they had not been taught by any theoretical reasoning*; and supported as they are by the experiments of Mr. Sinclair and numerous others, they form a mass of evidence totally incontrovertible.

It is a custom in most counties of England to apply salt and water as a steep to prevent the ravages of the disease in wheat, called smut; the value of this is known to almost every farmer. Recent experiments have suggested that it may even be of use, when employed in larger quantities, as a preventative of mildew—the most dreadful of the numerous diseases to which the cultivated grasses are exposed. The experiments of the late Rev. E. Cartwright strongly evidence, that when a mixture of salt and water is sprinkled with a brush upon diseased plants, it is actually a complete *cure*, even in apparently the most desperate cases.

"The proportion, one pound to a gallon of water, laid on with a plasterer's brush, the operator making his casts as when sowing corn: it is instant death to the fungus." The time and expense is trifling.

It appeared in the course of some enquiries made by the Board of Agriculture, that a Cornish farmer, Mr. Sickler, and also the Rev. R. Hoblyn, were accustomed to employ refuse salt as a manure, and that their *crops were never infected with the rust or blight*.

BARLEY AND OATS.

Apply from ten to sixteen bushels per acre just before you sow the seed.

Mr. Legrand, a Lancashire farmer, states, "in a sandy soil I can assert sixteen bushels be a proper quantity for a statute acre; it gradually advanced in its beneficial effects to sixteen bushels, and as gradually diminished to four bushels where vegetation was stopped."

A Suffolk farmer, Mr. Ransom, of Sproughton, also says, when speaking of his experiments on a light sandy soil, "The Barley thus dressed, *presented no difference of appearance to the rest of the field*, until within a fortnight of harvest; the salted crop was then [illegible] and about one week forwarder than the rest of the field." The following are the results [illegible] carefully cut and measured.

PRODUCE IN BUSHELS	Per Acre
Soil without any manure	[illegible]
Soil dressed with 16 bushels of Salt per acre, in March	[illegible]

Were these gentlemen, too, deceived in their experiments? Had they both the misfortune to be in error?

Six bushels of salt per acre were applied by hand, in April, 1828, to a field of oats attacked by the slugs and worms, on the farm of Mr. John Slatter, of Draycote, near Oxford. The crop was completely saved by this application, although an adjoining field, *not salted*, was completely destroyed by the same vermin.

What answer can be given to this statement of a plain practical farmer? Is half a crown's worth of salt too dear an application to save an acre of corn from utter destruction? Must the worms still be suffered to devour annually thousands of acres of corn, and the farmer yet regard the employment of salt with all the apathy of indolence.

TURNIPS, MANGOLD WURZEL, &c.

We select from our latest communications the following from Killerton, in Devonshire. In a letter dated August 26, 1826, Sir Thomas Ackland, Bart. favored us with the following statement from his bailiff:—"The first experiments I made of salt for manure was on seven acres of land for mangold wurzel. I first heaped out the field with earth forty heaps to an acre, as is usually done for lime: I then put in each heap, thirty-three pounds of salt, and mixed it well with the earth, and let it lie a fortnight before I spread it over the land; after that I ploughed the land three times before I sowed the seed, and I had roots there 32lbs. each. Since that time I prepared a field of five acres in the same way for turnips, one third part of the field with lime. one third with salt, and the other part with hearth ashes. When the seed came up first, the turnips appeared most promising where the hearth ashes were; but after the first month, the turnips did not grow so fast as where the salt or lime was; after that time, the turnips, where the ground was manured with salt, grew faster, and the green looked stronger and darker, and at the end of the season was the best crop.

"The next year I put the field to barley; and where the salt was put, it was the strongest and best crop. After that time, it was a great deal heavier to work; therefore I consider it a good manure for light sandy soils, but not calculated for clay or heavy lands."

Mr. Hare, of Beaconsfield, in Buckinghamshire, uses salt regularly. In 1822, one acre of a large field—the soil very gravelly, he applied about two cwt. of salt, without any other manure; the rest of the field was manured as usual. The turnips produced on the salted acre were just as good as on any other part of the field. In the following year, on another field of the same quality, he manured the whole field with farm yard manure, adding to one acre of the field 2½ cwt. of powdered rock salt. On this *salted* and *manured* acre, he had more and finer turnips than were? produced on any other field of equal extent in the whole parish. He approves of it also very decidedly for barley.

GRASS LANDS.

Apply from ten to fifteen bushels per acre in the autumn.

We rejoice to find that, in Devonshire, salt has found, in Mr. Collyns, of Kenton, an able and zealous advocate, from a letter dated October 17th, 1826, with which I was favored by that gentleman. I make the following copious extract:—

"One of my neighbours writes me, in using salt as a manure on grass land, I have found the salted portions not to be effected by severe frosty nights, when every blade of grass on the unsalted portions have been in a frozen state.

"I observe, too, that it is destructive to every kind of grub and worm; and I am convinced, where it has been used with judgment, that it has not failed." Another intelligent neighbour, continues Mr. Collyns, whose farm is almost entirely a light black sand, writes —"I have found salt answer my most sanguine expectations for barley, oats, potatoes and turnips, both as to the increased quantity and improved quality of the crops, of which I can now give ocular demonstration to any one you will send; my barley and oats, which used to yield me only 15 to 20 bushels per acre, now yield from 40 to 45. My wheat is certainly much improved in quality, but I expected more in quantity. I have had 35 bushels of wheat from an acre dressed with ten bushels of salt; and from the same field last year after the same quantity of salt, 140 bags of potatoes per acre. This year again, dressed with ten bushels of salt, I have not more than 20 bushels of wheat per acre, but the quality very superior indeed, and the root of clover in it is very fine and luxuriant. In every field I have salted, I find the grass very much superior to any produced before the use of salt.

"I have since, adds Mr. Collyns, gone over his farm, and am astonished at the verdant pasturage, in what used to be coarse and rushy meadows. In this arable land he never got more than ten bushels of wheat per acre until he used salt; so that this is also a decided improvement."

I will give but one other testimony in favor of its use, and that, one of the latest I have received from an old Suffolk agriculturist, Mr. Broke, of Capel, near Ipswich:

In the month of April, 1821, six bushels of salt manure were applied to half an acre of red clover,—the soil good turnip land, not sharp; extent of the field ten acres. The salted clover, at first looked very yellow and apparently injured, but it soon began to recover, and when mown, the increased produce was, at the very least, 10 cwt. per acre; and the aftermath proportionately good; the cattle eating it down closer, and in preference to every other part of the field.

POTATOES.

Apply from ten to twenty bushels of salt to the surface as soon as the potatoes are planted or ten bushels in the previous autumn, and ten after inserting the sets.

My experiment with salt to potatoes were upon light gravelly soil. The result was as follows.

Experiments	PRODUCE IN BUSHELS.	Per Acre.
1. Soil without any manure		120
2. Soil manured with 20 bushels of salt, the previous September		192
3. Soil manured with stable dung at the time of planting		219
4. Soil manured with stable dung and twenty bushels of salt		234
5. Soil manured with 40 bushels of salt alone, 20 in September and 20 in the spring, after the sets were planted		192
6. Soil manured with 40 bushels of salt as in the last experiment, and also with stable dung		2

These experiments are entirely confirmed by those of the Rev. E. Cartwright, of Tonbridge. From a copious table which the farmer will find in Mr. Johnson's Essay on Salt, the following statement is extracted .

Experiments.	PRODUCE IN BUSHELS.	Per Acre.
1. Soil without any manure		157
2. Soil, manured with 9 bushels of salt per acre		198
3. Soil manured with 8 bushels of salt and 30 bushels of soot per acre		240
4. Soil manured with 30 bushels of soot per acre		182

"Of ten different manures," concludes Mr. Cartwright, "most of which are of known and acknowledged efficacy, salt, with one exception, is superior to them all."

HAY.

Put about half a bushel of salt to every load of hay, spread it by hand or through a sieve. Mr. Wood, of Ingatestone, in Essex, has employed it for thirty years ; his plain unvarnished statement need not be supported by any other.

"I used about a quarter of a peck at each laying, thinly spread, which I find is about four bushels to a stack of 20 loads, I am fully satisfied that double the quantity would be much better."

"In a particularly wet season, a few years since, I used twelve bushels to a stack of forty loads, the whole of which was consumed by my own horses, and I never had them in a better condition. I am so fully convinced of the benefit of salt to hay, that while it is allowed duty free, I shall use it in all seasons." (For other testimonials to the same effect, see Essay on Salt, page 100.)

The avidity with which animals consume salted hay, is not so generally known as it ought I will give, therefore, a curious fact related to me a short time since, by Mr. Law, of Reading.

Mr. Green, of Wargrave, in Berkshire, had, in the season of 1824, a parcel of sour rushy hay from a meadow on the banks of the Thames, which both he and his men despaired of rendering of the least value ; it was therefore stacked by itself, and well salted ; the quantity supplied was large, but Mr. Law did not know the exact proportion.

When the period arrived that his sheep wanted a supply of hay, he directed his shepherd to use the salted inferior hay first, and to his surprise, the sheep consumed it with the greatest avidity. The stack being finished, the shepherd was directed to supply them now with the best hay he could find of other stacks of fine meadow hay.

He came, however, the next morning to his master, and made the following remark :—"We sir, must have made a great mistake, and forgotten which stack we salted, for our sheep will not eat the hay which we think the best.

LIVE STOCK.

The importance of salt to animals is so generally admitted, even by those who deny its value as a manure, that I shall not here dwell at great length upon it. When animals are in a wild state, it is observed, that at certain periods of the year they seek the salt water, or salt springs inland, with great avidity ; and every farmer observes, that his cattle, horses, &c. are remarkable fond of licking the salt earth of the farm yard stables, &c. In Spain, they give their sheep salt with great regularity, 112lbs. in five months to one thousand sheep ; as such, I fearlessly assert, that the importance of salt for cattle is incontrovertibly established, however imperfectly it may be practised. We subjoin the statement of the late Mr. Curwen, M.P. for Cumberland. He employed salt for his live stock daily for years :

For horses he gives	6	oz. per day.
Milch cows	4	ditto
Feeding oxen	6	ditto
Yearlings	3	ditto
Calves	1	ditto
Sheep	2 to 4	per week

If on dry pastures ; but if they are feeding on turnips or coles, then they should have it without stint.

Some give it to live stock on a slate or stone, some lay lumps of it in the cribs or mangers. It is a fact *indisputably proved*, that if *sheep are allowed free access to salt, they will never be subject to the disease called the Rot.* Is not even this a fact worthy of the farmer's earliest, most zealous attention?

Some recent experiments also lead me even to hope that I shall one day or other be able to prove it to be a *cure* for this devastating disease. I have room but for one fact.

"Mr. Rusher, of Stanley, in Gloucestershire, in the autumn of 1828, purchased for a mere trifle twenty sheep, *decidedly rotten*; and gave each of them, for some weeks, an ounce of salt every morning.

Two only died during the winter: the surviving eighteen were *cured*, and have now, says my informant, "lambs by their sides."

Mr. Butcher, now of Brook Hall, in Essex, for years employed salt for his cattle and sheep, on his farm near Burnham, in Norfolk. One of his fields was so very unfavorable for sheep, that before he used salt, he had lost ten or twelve sheep in a night, when feeding on the turnips; but after he adopted salt, he never lost one. He used to let the sheep have the salt without stint; and he remarked, that the *sheep* always consumed four times the salt *on this particular field*, than when feeding on any other on the farm.

Mr. Butcher one year let this field of turnips to a neighbour, who did not use salt; and consequently, after losing ten sheep the first night, gave up the field in despair.

Sir Jacob Astley, of Melton Constable, in Norfolk, gives about a table spoonful of salt per week to each of his fox hounds,—it keeps away distempers, and preserves them in the best health and vigour. It is administered wrapped up in paper as a bolus.

Although the use of salt for live stock is now becoming quite general, yet the enlightened farmer must not suppose that its introduction, even for that important purpose, was the work of a day. The very magistrates were opposed to its use—for, only a few years since, some honest farmer's servants were brought before a justice of the peace at Winchester, charged, by their ignorant master, with the dreadful crime of giving his horses salt in their corn. "I should not have suspected it," said the farmer, "had not my horses' coats *become so fine* lately" "Salt for horses!" exclaimed the indignant magistrate, "can any thing be more poisonous? Let the rascals be committed to the Bridewell for a month."

HORTICULTURE.

In the garden, much good may be effected by a judicious emloyment of common salt. We are indebted to George Johnson, Esq. for several important experiments with salt, in the kitchen garden; they were made with much care, and we can vouch for their correctness.

The soil was sandy; and we abridge from his paper, read before the London Horticultural Society, in November, 1821, the following detail of the result:—

WINDSOR BEANS.

Experiments.	PRODUCE IN BUSHELS. Per Acre.
1. Soil without any manure	135½
2. Soil dressed with 20 bushels of salt per acre, week before seed time	217

ONIONS.

	tons.	cwt.	qrs.	lbs.
Soil manured with 20 bushels of salt and 10 tons of farm-yard manure	3	12	3	12
2. Soil manured with 12 tons of farm-yard manure	2	10	2	19

CARROTS.

	tons	cwt.	qrs.	lbs.
1. Soil manured with 20 bushels of salt and 20 tons of manure	23	6	1	18
2. Soil, 20 tons manure only	22	18	0	26
3. Soil manured with 20 bushels of salt only	18	2	0	0
4. Soil without any manure	13	4	0	0

PARSNIPS.

	tons.	cwt.
1. Yard manure 20 tons, salt 20 bushels	6	15
2. Yard manure 20 tons	6	11

EARLY POTATOES.

Experiment.	PRODUCE PER ACRE. Bushels.
1. Soil without any manure	308
2. Soil manured with 20 bushels of salt per acre	584

In 1826, salt at the rate of 20 bushels per acre was applied, soon after the seed was sown, to *half* of a carrot bed, in a garden belonging to Richard Francis, Esq. Droitwich; the summer proving dry, the carrots received but little benefit (the salt should have been mixed with an equal quantity of soot.)

In 1827 the same bed, without any additional manure, being sown with peas, presented a most remarkable appearance,—for when the peas on the unsalted portion were only four

inches high, the salted were at least sixteen inches, and nearly in bloom,—they yielded five or six times as many pods, and those full three weeks earlier than the unsalted portion.

Will not the market gardener be able to avail himself of this curious property of salt? I can testify from my own experience, that salt forwards the growth of potatoes, &c.

In the experiments of Dr. Priestly, upon various plants vegetating in salt and water, the use of salt materially protracted the existence of the plant. Flowers, kept in water vases, continue much longer in bloom, if a portion of salt be added to the water. It is a common custom with the importers of exotic plants, to dip cuttings into salt water. Before the adoption of this plan, they almost invariably perished in the passage.

To explain these curious facts, it is supposed that the salt acts as a stimulant to the plant. The word stimulant, however, being merely used for the want of a better, as most of the amazing processes and wondrous phenomena of vegetable life are too inscrutable but for the eye of Him

"Who spoke the word, and Nature moved complete."

Among our very last letters received on the use of salt in the cultivation of plants, was one from an eminent florist, near Paddington, Mr. Thomas Hogg, and I will here transcribe his own words:—

"From the few experiments that I have tried with salt as a garden manure, I am fully prepared to bear testimony to its usefulness. In a treatise upon flowers, published about six years since, I remarked, that the application of salt, and its utility as a manure, was yet imperfectly understood, It is a matter of uncertainty, whether it acts directly as a manure, or only as a kind of spice or seasoning, thereby rendering the soil a more palatable food for plants.

"The idea that first suggested itself to my mind, arose from contemplating the successful culture of hyacinths in Holland. This root, though not indigenous to the country, may be said to be completely naturalized in the neighbourhood of Haerlem, where it grows luxuriantly in a deep sandy alluvial soil: yet one great cause of its free growth, I considered, was owing to the saline atmosphere; this induced me to mix salt in the compost; and I am satisfied that no Hyacinths will grow well at a distance from the sea without it. I am also of opinion, that the numerous bulbous tribe of Amaryllisses, especially those from the Cape of Good Hope; Ixias, Alliums, which include Onions, Garlic, Shalots, &c. Anemonies; various species of the Lilly; Antholyza; Colchicum; Crinum; Cyclamens; Narcissus; Iris; Gladiolus; Ranunculus; Scilla, and many others, should either have salt or sea sand in the mould used for them.

"I invariably use salt as an ingredient in my compost for carnations; a plant which, like wheat, requires substantial soil, and all the strength and heat of the summer to bring it to perfection; and I believe I might say, without boasting, that few excel me in blooming that flower.

"If I wished to refresh and improve a soil of what is called an old worn-out garden, exhausted by fifty years' cropping, or more, I would give it (½ or ¼ part at a time) a good dressing of lime in the autumn, spreading it as soon as it was slacked, and forking it in immediately. I would, a week or two after that, dig and trench it well in the rough, and lay it up for the frost to act upon; and then, in the spring, I would give it a good dressing of salt (not less than six bushels to an acre.) The good effect of such treatment would be manifest for two or three years after."

SAINFOIN.

Sainfoin (*Hedy'sarum Onobry'chis*), Diadélphia Decándria, Linn.; and Leguminósæ, Juss.

This plant is a deep-rooted perennial, valuable on account of its growing and thriving on soils unfit for being constantly under tillage. Sir John Sinclair says, "it is one of the most valuable herbage plants we owe to the bounty of providence."

Culture, &c.

SOIL.

The soil best adapted for this plant is that of chalk, but it will grow on any soil provided it has a dry subsoil. It succeeds in a most perfect manner in soils of dry chalk and limestone.

PROPAGATED.

By seed, which is almost always sown broadcast; it may, however, be sown in drills, or even transplanted, but neither of these modes can be recommended.

Time of sowing.—The sowing ought never to be deferred longer than March, and it is still better to complete this work in February. Some cultivators however sow in April,

and sometimes much later; but the March sowing is by far the most usual, and undoubtedly the best.

Quantity of seed.—The quantity of seed sown per acre, materially depends upon the strength of the land, and whether sown broadcast or drilled; if the former, from three and a half to four bushels will be required;—but if drilled, which is very rarely done, two bushels will be found sufficient. Being a very precarious seed, a great quantity, if not well covered, will be destroyed by frost in the first winter; great care should therefore be taken to harrow it well in, and finish by running the roll over it.

Choice of seed.—Good seed may be known by the husks being of a bright color, the kernel full and plump, of a light grey or blue, though sometimes of a shining black. If when the kernel is cut asunder it appears greenish and fresh, it is a certain sign of being good, but if it appears of a yellowish color and looks thin and pitted, it should be rejected. Fresh seed should always be used, as when old, it seldom if ever vegetates in a perfect manner.

Preparation of the land.—As this is a permanent plant, a particularly good preparation is necessary, that of trenching is unquestionably the best. The preparatory culture, however, is the same as for clover, with the exception of deeper ploughing immediately after the preceding crop is taken off, so as to expose it to the action of the air and frosts. It is generally made to succeed a turnip crop, sown either with or without barley or oats. Some agriculturists deprecate the method of sowing it with corn, causing, they say, the sainfoin to be drawn up weak and tender.

Boys, in his communications to the Board of Agriculture, recommends the following preparation:—first year, pare and burn for turnips, to be eaten on the land by sheep; second year, barley to be sown very early with clover seed; third year, clover eaten off by sheep; fourth year, wheat; fifth year, turnips with manure; and sixth year, barley with sainfoin. Under this method of culture the produce has been very extensive.

After-culture.

The after management of sainfoin consists in giving it occasional top-dressings of manure. Peat ashes are considered a very excellent material, if they can be procured in sufficient quantity. Soot, and even malt dust, have been used with great success and advantage; but whatever kind be used, it should be applied so as to form a thin, regular, and even dressing over the whole surface of the crop. If top-dressings are regularly and judiciously applied every third or fourth year, it is supposed that sainfoin would continue vigorous for ten or fifteen years; but its usual duration, in a profitable state, is generally estimated to be from eight to ten years. All stones or hard bodies should be removed, and thistles, docks, and other weeds, cut out by the roots.

Taking the crop for hay.—As soon as the general appearance indicates that the crop is in full blossom, it should be mown down by cradle scythes, and remain in the state in which it falls till it is about two-thirds dry. It is then carefully turned over with rakes or large forks as soon as the dew is off the ground; and if the weather be favorable and the sun powerful, it will be fit to cock the next morning, and may be carried in the course of the day. In loading and unloading, care should be taken to shake it as little as possible, as the leaves rub off very easily. It should be thatched immediately the stack is finished, That which is put up quite dry will come out of the rick of a bright green color, while that which has been much heated will look brown.

Produce.—The produce of this crop is seldom less than two tons per acre, but two and a half, and even three, are no unusual quantities.

Cropping the aftermath.—It is not advisable to turn in sheep or neat cattle for at least fifteen days after the crop is carried; but if time be given for it to recover itself there will be more food, and the plant will be in better condition to bear the cropping.

Taking the crop for seed, requires a little attention and experience to know at what degree of ripeness it is best to cut it as they do not all ripen at one and the same time. The central ears blossom before the lateral ones, and every one begins blossoming like the bean at the lower part, and continues blossoming gradually upwards for several days, by which means the pods are formed and almost filled at the bottom, before the flower is gone off at the top. If the cutting therefore be deferred until the top seeds are quite ripe, the bottom ones which are the plumpest and best, would shed and be lost. The best time, therefore, to cut it, is when that which blossomed first is ripe, and the last blown beginning to be full, for then the latter will ripen after cutting, and be nearly as good as those which were ripe first. By neglecting these precautions much of the best seed is frequently lost.

Harvesting.

The greatest care is necessary in havesting the seed; if it is done in the heat of the day when the sun is powerful, it will be impossible to prevent the shedding of the seed; the morning and evening therefore should be chosen for this work, and while the dews are on the plant, rendering it thereby retentive of its seed. In turning them the fork or handle of the rake is usually applied to the upper side of the plant, letting the root fall over last, in order to prevent the violence of the fall from shaking out the seed.

"When sufficiently harvested it should be carried into barns or stacks, and should not

be thrashed till a very short time before the seed is wanted for use, as it will keep much better in the pod than when thrashed and laid in heaps, as in that case it is very apt to heat, which will of course destroy its vegetating powers. Care must be taken that it is thoroughly harvested and dry before it is carried, if not, both seed and haulm will spoil. It is in perfection when the husk is bright and of rather a light brown color, which upon being cut asunder appears green and fresh, and free from any sour smell. Any other appearances than these are certain criterions of defect.

The produce of the seed varies from twenty-five to thirty-five bushels per acre, according to the season and state of the land.

USE.

The manner in which this crop is generally disposed of is chiefly as rack meat for horses, and being of a less flatulent quality than clover or lucern it is preferred by some as green food for cattle and sheep, and is either cut for soiling, or eaten on the spot by hurdling or common pasturing.

SAVORY.

Savory (*Saturéja*), Didynámia Gymnospérmia., Linn.; and Labiátæ, Juss.

Of the savory there are two varieties in cultivation:—

1. The Winter Savory (*Satureja Montana,*) a perennial under-shrub.
2. The Summer Savory (*Satureja Hortensis,*) a hardy annual shrub.

Culture, &c. of the Winter Savory.

SOIL.

The winter savory will grow in any light mellow soil.

PROPAGATED.

By slips or cuttings of the young side shoots, which may be planted in any of the summer months, in a shady border and watered. As soon as they are advanced in growth and become branchy, they may be set out either to form a close edging, or singly, at a foot or fifteen inches apart.

Culture, &c. of the Summer Savory.

SOIL.

The same description of soil as that for the winter variety.

PROPAGATED.

By seed, sown in March or April, either in small drills six or nine inches apart, or broadcast and raked lightly in. The plants may either remain to be thinned or transplanted in June nine inches asunder.

Taking the crop

1. *The winter savory* may be gathered when of full growth, in autumn, to dry for winter use.
2. *The summer savory* comes in for gathering, from June till October. When a store is intended to be dried it should be pulled up by the roots.

USE.

Chiefly as culinary aromatics, and sometimes in medicine, being accounted by some, one of the best antiscorbutics.

SEA KALE.

Sea Kale (*Crámbe Marítima*), Tetradynámia Siliculósa, Linn.; and Crucíferæ, Juss.

Sea Kale is a hardy perennial plant, a native of various parts of the shores of Britain. It is described as an *asparaginous* plant, and in some respects it is treated as asparagus, that is, it is bleached or blanched, and then boiled like that vegetable, which in taste it somewhat resembles, or rather blends the flavor of asparagus with that of cauliflower or white broccoli, but in growth it is much more like celery than asparagus; and with respect to the botanical character, it is more nearly allied to the brassica or cabbage tribe.

Sea Kale is a choice and delicate vegetable, is of the most ready culture, and bears forcing remarkably well.

Culture, &c.

SOIL.

The native bed of the sea kale is deep sand, with a little alluvial matter from the sea; hence, according to Abercrombie, a light dry moderately rich mould of loose texture suits it best. A fit soil for it may be composed of one half drift sand, two-sixths rich loam, and one-third small gravel, road stuff, or sea-coal ashes. If the loam be not rich, add a little rotten dung. Sea weed is a good manure for this maritime plant.

PROPAGATED.

1. *By seeds,* sown in March or April, either in beds where they are to remain after the manner of asparagus, or in separate beds for the purpose of transplanting; in the latter case, a bed four feet by nine, sown in drills a foot apart, two ounces of seed will be required; but if sown where they are to remain, a similar quantity of seed will be sufficient for a bed four feet wide and fifteen feet in length, the drills being two feet apart.

2. *By cuttings of the roots or detached offsets,* for this purpose plantations may be formed early in April, by taking off rooted offsets from established plants, or by cuttings from the roots, with two or three eyes to each cutting. Dig and trench the ground to the depth of at least twenty inches; lay six inches of sea weed or vegetable compost at the bottom of each trench, add a large portion of sandy soil, or pure sand, so as to raise the bed to the full depth of two feet of good light earth. If the bed be formed six feet wide, plant three rows of cuttings or offsets; that is, one row in the centre and two other rows, one on each side of the middle one and two feet from it. These three rows will occupy four feet, and leave a foot of earth on both sides of the outer rows. Plant the sets eighteen inches asunder in the row, and so deep as to allow of the upper part or crown being at least two inches below the surface of the ground. Make the bed perfectly level and cut its edges even, and form alleys as directed for asparagus. Keep it free from weeds at all times, and in two years from the time of planting some good kale may be cut for use.

Sea kale, however, is almost always propagated by seed, which is unquestionably the best method. Maher adopts the following plan:—"Prepare the ground in December or January, by trenching it two feet and a half deep, if not of that depth naturally, and light, it must be made so artificially, by adding a due proportion of fine white sand, and very rotten vegetable mould; if the ground is wet in winter, it must be effectually drained, so that no water may stand within a foot at least of the bottom, for the strength of your plants depends on the dryness of the bottom and richness of your soil. Then divide the ground into beds, four feet wide, with alleys of eighteen inches, after which at the distance of every two feet each way, sow five or six seeds two inches deep in a circle of about four inches in diameter; this operation must be performed with strict care and regularity, as the plants are afterwards to be covered with the blanching pots, and both the health and beauty of the crop depends upon their standing at equal distances. In the months of May and June, if the seeds are sound the young plants will appear. When they have made three or four leaves, take away all but three of the best plants from each circle, planting out those you pull up (which by a careful hand may be drawn with all their tap-root) in a spare bed for extra forcing, or to repair accidents, If the months of June or July prove dry, water the whole of the beds plentifully. In the following November, as soon as the leaves are decayed, clear them away and cover the beds an inch thick with fresh light earth and sand that has lain in a heap, and been turned over at least three times the preceeding summer; this, and indeed all compost, should be kept scrupulously free from weeds, many of which nourish insects, and the compost is too often filled with their eggs and grubs. Upon this dressing of sandy loam, throw about six inches in depth of light stable litter, which finishes every thing to be done the first year. In the spring of the second year, when the plants are beginning to push, rake off the stable litter, digging a little of the most rotten into the alleys, and add another inch in depth of fresh loam and sand. Abstain from cutting this year, though some of the plants will probably rise very strong, treating the beds the succeeding winter exactly as before. The third season, a little before the plants begin to stir, rake off the winter covering, laying on now an inch in depth of pure dry sand or fine gravel. Then cover each parcel with one of the blanching pots, pressing it very firmly into the ground, so as to exclude all light and air; for the color and flavor of the sea kale is greatly injured by being exposed to either."—*Hort. Trans.* vol. 1.

Barton, (from the *Caledonian Hort. Mem.*), in the autumn, covers all the sea kale (excepting the roots intended to be taken up for forcing,) with leaves as they are raked from the pleasure grounds, covering each bed in thickness according to the strength and age of the roots, giving the greatest covering to the oldest; upon an average from five inches to a foot when first laid on. He then lays over the leaves a covering of long dung, just sufficient to prevent the leaves from being blown away. The advancing heads press up the covering, so as to be easily perceived, and they are then cut without removing more of the covering than that about the heads to be cut. He defends the practice of cutting one

year old plants as not being injurious. After the kale is all taken he removes the coverings and digs the ground regularly over.

The following method is recommended by the author of the Gardener's Manual In October or November, when the leaves begin to decay, cut them down close to the heads and carry them to some waste ground. If suffered to remain, they will rot and fall off of themselves, leaving a very unsightly and decayed mass of litter. Dig the earth between the plants, and mark each with a small stick; then cover the whole bed to the depth of two or three inches with coal ashes and well decayed manure, in about equal proportions, or with road sand in which there is a good portion of carbonate of lime, sprinkle common salt over the sand in the proportion of three quarters of a pound to each square yard. Let this covering remain till the forcing season arrive, or if the kale is not to be forced, till the heads incline to emerge, then proceed to blanch the plants."

Blanching and Cutting the Sea Kale.—If no forcing be attempted, the sea kale will, in all probability, be in season from the last week in March to the end of April, allowing for the state of the weather and the age of the plants, the strongest shoots coming in the first. Early in February, and even in January, if the weather be open, and appearances promise an early spring, examine each bed to see that it is sound, the little marking sticks will point out the precise situation, and over the centre of each sound root place a very large-sized flower pot, the hole of which is closed with a cork, but prefer a proper sea kale pot without any hole. Small tubs or boxes, a foot in diameter every way, will do. Press the vessel firmly into the sand, and if tubs be used cover the whole with mats to exclude the light, the influence of which it is that gives color to the plant. Lift up the pots or tubs now and then, to see if the heads come on, and to remove slugs and other vermin. If these appear, sprinkle salt or quick lime dust around the plants three or four inches from each. In common seasons, the kale, it is probable, will in succession attain the height of from six to eight inches, being of a clear milk white, the tips and upper edges of which are tinted with a fine purplish crimson, these are the incipient leaves, among which are sometimes to be seen the young corymbous clusters of flowers. The whole forms as beautiful an object as can be well conceived; and this is the sea kale in perfect condition and ready to be cut for use. Remove the shoot with a clean cut, close to, but not below the part where the leaf stalk joins the head, it is narrower there, and to make sure of the operation remove the soil from around the stem, and the proper place will be apparent. When the sea kale is cut remove the pot or covering from that root, and when all the shoots are taken, add a coating of well decayed vegetable compost or leaf mould, to the depth of two or three inches, and then dig the bed carefully, cut the edges and keep it constantly free from weeds.

Forcing Sea Kale. Pursue the same method, but fill in all the spaces between the pots with stable dung which has been prepared for some time, and add a covering of the same over the tops of the pots, and a lining about the sides of the beds. The dung must not be hot, it is to be turned repeatedly till the heat be found not to exceed 55 or 60 deg. That Maher observes, "that the only thing necessary in forcing sea kale, is to be very particular in guarding against too much heat, using trial sticks, and never, if possible, exceeding 55 deg. *Abercrombie*, *Nicol*, and *Maher*, recommend forcing in the open air The former directs to begin the work seven weeks before the plants are wanted. The beds are to be set in order, the surface to be moved, and two or three inches of a mixture of coal ashes, fresh light earth, and drift sand to be spread over it. Dung which has been prepared for three weeks, either alone or mixed with tree leaves, is to be placed all around about, and over each pot, extending eight or ten inches beyond and above the pots. These are to be examined frequently, and the heat attended to. If the heat be under 50 deg. there is not enough to excite the plants; and if above 60 deg. it is too fiery and may injure them. In about three weeks or a month after being covered up, the first shoots will be from six to ten inches long, and fit for the table. If the plant send up a flower-stalk cut it away, and successive supplies of shoots will be produced till perhaps the end of the third month from beginning to force. Baldwin forces sea kale where it stands in the open garden in the following manner.—" On each side of a three feet bed in which the sea kale has been planted, trenches are formed two feet deep and eighteen inches wide at the bottom. The side of the trench next to the bed is perpendicular, and the other side is sloped, so as to make the top of the trench at the surface of the ground two feet and a half wide; this trench is filled with linings of hot dung, on the inner edges of which garden lights are placed, and the lights kept covered with mats till the kale is fit to cut. The same plan," he adds, " is applicable to asparagus and also to rhubarb, or any other perennial vegetable intended to be excited where it stands, and a covering of boards, canvass, or mats, might be substituted for the glass lights Barton forces on dung beds under frames exactly in the manner generally adopted for asparagus The advantages he considers to be, the certainty of having the latter vegetable fit for use at any particular time, and the saving of dung and labour. The latter saving," he says, " must appear obvious to every practical gardener, when he considers the difficulty attending the keeping up a proper and regular degree of heat by covering with dung over pots, and other similar methods (as generally practiced) at so inclement a season of the year, requiring three times the quantity of dung to produce an equal number of heads, to what will be

necessary when the roots are placed in a frame; for a common melon frame will contain as many heads as are capable of being produced in two drills of twenty yards each, by covering with hot dung. He finds two frames of three lights each, quite sufficient for a large family; the first prepared about the beginning of November, and the second about the last week in December; and by the time the second frame is exhausted, sea kale will be ready for use in the open ground.

In comparing the three methods of forcing which have been detailed above, it will appear that those of Baldwin and Barton must be attended with a saving of stable dung; but if delicacy of flavor, and consequently the total exclusion of light be the chief object of the grower, the common method of forcing with pots and a covering of dung must be deemed the most efficient. The truth is this, that in sea kale, as is the case with asparagus, a slight degree of color is always attended by an increase of flavor; therefore when perfect blanching (*etiolation* as it is termed), and delicacy of flavor are the chief objects, the common method is to be preferred; but when a degree of color, and a proportionate fulness of flavor are not objected to, Baldwin and Barton's methods are much superior to it, because although they admit a portion of air as well as light, they economise manure, and labour. By Baldwin's plan the roots also are preserved, whereas they are sacrificed if that of Barton's be pursued; for in forcing asparagus and sea kale in frames, over dung hot beds, the plants are stowed as closely as is consistent with the temporary vegetation required, and with no more intervening and surrounding soil than is absolutely necessary to supply the roots; hence they cannot be used again, and the succession must be provided for by annual sowings; the plants being allowed two or three years' growth before they are taken up for forcing."

Saving the seed.—Select one of the finest plants that exhibits the flower-stalk, and let it run up in spring; it will flower and produce abundance of seed, which when the silicles, or pouches, become ripe, may be gathered and preserved entire, in a dry room for future use.—(*Gardener's Manual.*)

USE.

The young shoots and tops of the unfolding leaves when blanched, are the parts to be used, and are not at all inferior to asparagus, and are by many even preferred to that vegetable. Vegetables are seldom improved by forcing, but sea kale is certainly a remarkable exception. It is observed by Sir G. Mackenzie, that sea kale cannot be easily overdone in cooking, and that after being well boiled it should be thoroughly drained, and then suffered to remain a few minutes before the fire, that a further portion of moisture may be exhaled.

SHALLOT.

Shallot (*A'llium Ascalónicum*), Hexándria Monogy'nia, Linn. and Asphodéleæ, Juss.

This is a small bulbous-rooted plant of the garlic family.

Culture, &c.

SOIL.

A dry rich garden soil is best suited to this plant.

PROPAGATED.

By dividing the clustered roots into offsets. These may be planted in February, or as early in March as the ground will permit, or in October or November.

Where the soil is dry and other circumstances favorable, sets planted in autumn produce the finest bulbs; but if much wet reach the bed in winter the cloves perish. Spring planting is the safest. but it should be done before the cloves begin to shoot. The offsets should be planted out in rows, six or eight inches apart, and stand four inches apart in the rows.

It would appear from Mr. Knight's experiments, that the bulbs should always be planted on the surface of the ground. His views will be better understood from the following extract from the second volume of the Horticultural Society's Transactions.

" The habits of bulbous-rooted plants of different species relatively to the depths to which they naturally retire beneath the soil, admit of much variation, some occupying its surface, and others descending considerably beneath it. These circumstances do not appear to have been sufficiently attended to, and injurious consequences have probably been the result in many cases.

I have been led to adopt this opinion, and to make the experiments which are the subject of this communication, by a complaint of my gardener, that the greater part of his shallots had, during several years, generally become mouldy and perished; and I found on enquiry, that the same thing had very often occurred in other gardens of the vicinity. The bulbs had in all cases been planted, according to the directions of different writers

upon Horticulture, two or three inches beneath the soil; and to this cause I attributed their failure.

A few bulbs of this species, which were divided, as far as practicable, into single buds, were therefore planted upon the surface of the ground, or rather above it, some very rich soil having been placed beneath them, and the mould having been raised on each side to support them till they should become firmly rooted. This mould was then removed by the hoe and watering pot, and the bulbs in consequence were placed wholly out of ground. The growth of these plants now so closely resembled that of the common onion, as not to be readily distinguished from it, till the irregularity of form, resulting from the numerous germs within each bulb became conspicuous. The forms of the bulbs, however remained, permanently different from all I had ever previously seen of the same species, being much more broad and less long; and the crop was so much better in quality, as well as much more abundant, that I can confidently recommend this mode of culture to the attention of every gardener."

Taking the crop.

As soon as the leaves die they should be taken up and made perfectly dry in the sun, and stored for use.

USE.

The cloves are used in the manner of garlic and onions. They are often preferred to the onion on account of their agreeable flavour. In a raw state they are sometimes cut small and eaten with chops and stakes, and sometimes a clove or two is put into winter salads.

SHEEP.

On the Rearing, Breeding, & General Management of South-down Sheep.

BY JOHN ELLMAN, ESQ. LATE OF GLYNDE.

Having been particularly requested to write my opinion on the formation, breeding, and management of South-down sheep, I comply with the request, under the impression that the experience of upwards of fifty years, chiefly devoted to these animals, will be found of use to my fellow farmers. Should this prove to be the case, I shall not regret having undertaken the task.

As it will be necessary for the sake of perspicuity to divide the subject, I have adopted the following arrangement:—

1. The nature and habits of the South Down breed of sheep.
2. Remarks on their improved disposition.
3. Qualities constituting a disposition to feed.
4. Recapitulation of good qualities, size, &c.
5. General Management.
6. Diseases.

1. *The nature and habits of the South-down breed of Sheep.*

This breed was formerly of a small size, and far from possessing a good shape, being long and thin in the neck, high on the shoulders, low behind, high on the loins, down on the rumps, the tail set on very low, nearly perpendicular from the hip bones, sharp on the back, ribs flat, not bowing, narrow in the fore quarters, good in the leg with big bone. They are now much improved both in shape and constitution, owing to the exertions of many intelligent breeders, who have devoted during the last thirty or forty years, their immediate attention to the subject, and have so far been successful as to place many breeds of South-down sheep, both for symmetry and constitution, on an equallity if not superiority, with the best breeds of sheep in Great Britain.

2. *Remarks on their improved disposition.*

They are much improved in disposition from what they were formerly, being smaller in bone, equally hardy, with a greater propensity to fatten, and much heavier in carcase when fat. Seven stones was formerly thought a great weight for a South-down wether two years old, and they were seldom fattened until four years old; it would now, however, be a rare sight to see a pen of South-down wethers at market more than two years old, many are killed even before they arrive at that age. Whether the advanced age at which the sheep were formerly fattened, proceeded from the epicurism of our ancestors, or a want of disposition in the sheep to fatten at an earlier age, I must leave others to decide.

3. *Qualities constituting a disposition to feed.*

This is an important division of our subject, and to do it justice, it will be necessary to enter somewhat into detail. The following sub-divisions may tend perhaps to facilitate our enquiries.

1. *The sheep must be well bred i. e. the offspring of parents possessed of good qualities,* Where attention has not been paid to this axiom, I have seen the offspring every way inferior to both sire and dam, and I would rather therefore, breed from an indifferent ewe and ram, that I knew to be well bred, than from a ewe or ram, possessing a good external shape derived from an indifferent stock, where little or no attention had been paid to the breeding.

2. *The shape or skeleton must not be too large for the keep,* nor should the size of the bone be large and coarse. This is a consideration of great importance, nor would I recommend the other extreme as was the case with the breeders of the new Leicester sheep ; particularly the late Mr. Bakewell, to whom the country is greatly indebted for many important improvements in our sheep and cattle ; although nature should be assisted, yet in counteracting her laws, an injury is generally sustained. The new Leicester ewes were bred in my time so small in the bone, and consequently became so delicate in constitution, as to be unable to rear their own lambs ; here was an instance where fineness of bone was an injury ; the other extreme is equally inimical, a requisite proportion of bone is necessary to render the sheep sufficiently hardy to bear both changes of season and keep, it being totally impossible for any breeder at all times and seasons to give his sheep an equal quantity of feed throughout the year, as circumstances often occur to cause a deficiency in despite of all the care and attention that can be devoted to the subject. The alternations of heat and cold cannot be avoided, consequently breeders must see the necessity of breeding sheep sufficiently hardy to withstand these casualties

3. *The proper proportions of parts, or the make of sheep indicates a good disposition.* It is I believe, admitted by all breeders who have devoted much attention to the subject, that a well proportioned animal is the best criterion of a good constitution and aptitude to fatten, in proof of which the Spanish sheep, which when compared with any of the improved English breeds are very-ill shaped and handle hard under the skin, are very deficient in fattening qualities, so much so, that but very few graziers have been enabled to make them fat.

4. *Sheep handling soft and mellow in the flesh, is a good criteron of a good disposition to feed.* This is too much neglected both in sheep and cattle, those of the best disposition to feed, handle soft and mellow under the skin which should not be thick or very thin ; a thin skin indicates too much delicacy.

5. *The countenance of sheep is an indication of a good or bad disposition, quietude having much to do with the fattening qualities.* Sheep with large heads are seldom found to fatten very well, they may be hardy and bear the changes of the seasons and keep without wasting much in flesh, but they have not much propensity to fatten when turned into good keep. I have found by experience that delicate animals generally fatten quicker when on good keep, and are the soonest reduced by bad keeping. This induces me to think that both extremes are bad, and that it is highly necessary that sheep should have a good constitution, as well as a disposition to feed. A well formed animal is a criterion of both. It is also necessary to adapt the constitution somewhat to the soil and climate, as it would be folly to breed sheep, too delicate and incapable of bearing the cold, when intended to stock the South Downs and other exposed bleak situations, where the sheep must work all day to satisfy themselves with food ; and on the other hand it would be equally absurd, to give the same constitution to sheep, intended for the richest pastures, (there to fatten at an early period,) where they would fill themselves in half an hour, and then lie down to sleep. These cannot be bred too delicate or kept with too much quietude.

4. *Recapitulation of good qualities, size and age of sheep and time of fattening.*

This division will lead me to a more minute consideration of what constitutes a good form or skeleton of sheep.

1st. *Head.*—It appears from some authors, that all sheep were originally horned, and certainly from close observation, I am induced to draw the same conclusion, for it is no unusual circumstance to find among the South Down flocks, a ram lamb, with small horns, and this after the greatest attention has been devoted to their eradication. The smallness of a sheep's head is an indication of its being well bred. The head should certainly be neither too long, or too short, the lips thin and the space between the nose and the eyes, should be rather thin. The under jaw or chap, ought to be fine and thin, the ears tolerably wide, well covered with wool and not too thin. Sheep with large heads generally experience great difficulty in lambing, and it always indicates a want of aptitude to feed. The size also indicates a coarseness of bone and skin. I remember calling at Dishly, on the late Mr. Bakewell about forty years ago, when the fashion of the Leicester Breeders was to breed their sheep with very prominent eyes, which was considered to be an indication of good breeding. I pointed out my objections to Mr. Bakewell, at the time, and informed him, he would lose many ewes in lambing, he however

differed from me in opinion, perhaps without due reflection as it turned out afterwards that I was perfectly correct. I can see no merit in a very prominent eye, I rather admire a tolerable full bright looking eye,but the eyecup, or bone should not project, for the reason I have before stated. Sheep should be well covered with wool on the forehead and especially between the ears, as it is a great protection against the fly.

2nd. *Neck.*—The neck should be neither too long or too short, but thin next the head and tapering towards the shoulders where it should be broad, high and straight on the top, and not what is generally called ewe necked. Most south down breeders object to a long thin neck, as they think it denotes delicacy in which opinion I perfectly coincide.

3rd. *The Breast.*—The breast should be wide and deep, projecting forward before the fore legs. This is considered an essential point with graziers, as the breast gives the sheep a greater degree of weight, and also indicates a good constitution and disposition to feed. Sheep that are not well bred, are generally very narrow in the breast and light in the fore quarters. It is however to be regretted that although the breast is an essential point, it has been too much neglected by breeders.

4th. *Shoulders.*—The shoulders should not be too wide between the plate bones, but ought to be on a level with the chine, falling or bowing outside from the top to the breast, so as to afford the ribs, room to spring, which is a great point to be attended to, as well in neat cattle, as in sheep. If the shoulder blades are very wide on the top, it is generally found that the animal drops behind the shoulders, this hollowness behind the shoulders is not objected to by butchers, as they think it denotes weight, it is however very unsightly in any animal.

5th. *Back and Loins.*—The chine should be low and straight from the shoulders to the setting on of the tail. The ribs should project horizontally from the chine, in which case the animal will lay its meat on the prime parts. The loin should be broad and flat. The sides high and parallel, as wide at the fore-end as at the hind, enabling the first rib to spring out well, which rib should project rather more than the others. The rump should be long and broad, the tail set on high and nearly on a level with the chine. The hips should be wide, the space between the first rib and hip bone should be as narrow as possible, thus preventing the dropping of the belly. The ribs should be circular like a barrel.

6th. *Legs.*—The legs should be neither very long or very short; the hind leg ought to be full in the inside, at the point called the twist, the hock or hough turning rather out. The New Leicester Breeders object to the leg being very full outside, but my experience has not satisfied me that they are right. The Leicester sheep are very flat on the outside of the thigh, which these breeders consider correct, but I am of a different opinion, as it takes off much in weight from the hind quarter, and I have never experienced any inconvenience resulting from their being full outside of the thigh. The fore-legs should be straight from the breast to the foot and not what is termed knock-kneed.

7th. *The Belly or Body.*—Before the South Down sheep were improved, they were very flat on the ribs, or tub bellied, which is always the case with sheep and cattle if the ribs do not bow or spring out. The dropping in of the belly is an indication of weakness in the intestines, which is far from being desirable in any breed of sheep, as it prevents the laying on of flesh upon the chine.

8th. *The Bones.*—Formerly the bones of South Down sheep were of a large size and coarse, but since attention has been directed to the improvement of the breed, they have become much finer, yet not so fine as to render them too delicate.

9th. *Wool.*—The external appearance of sheep, indicates their constitution in a very great degree, and has a tendency to discover their disposition. It is the opinion of many, that the sheep which produce fine wool, are finer and better in the meat than those of coarse fleeces, and this I think is born out by the fact of fine woolled sheep, selling at better prices per lb. in the market, on account of their mutton giving greater satisfaction to the consumers.

As wool is an essential article with those farmers who keep large flocks of sheep, I would recommend them not to confine themselves to the growth of fine wool alone, but to pay attention as well to the weight of the fleece, as this is now become the primary object with the purchaser. It is therefore desirable that both weight and fineness of pile should be combined which I am convinced it is possible to attain by attention and proper management, although I do not mean to say that South Down Sheep will produce long combing wool like those in Romney-marsh or Lincolnshire, as the pasture on the South Downs precludes the possibility of such a result but if the Romney Marsh sheep, were to be fed exclusively on the Downs, a decrease in the length of pile must necessarily be the consequence. That the production of the wool is modified by the nature of the keep cannot be doubted, for when South Down sheep are taken from the Downs and put on rich pastures, their wool becomes much longer and heavier. The method for producing longer wool in my opinion is to weigh the fleeces of the Rams, and use those rams only which grow the heaviest wool if fine, attention being paid at the same time to the shape and constitution of the rams. By this method flock masters may very materially improve their wool both in quality and quantity, a circumstance that has been so much overlooked by them that I

have often expressed my astonishment that they could be really so blind to their own interests. How few breeders are there who pay sufficient attention to the frame of a sheep, one looks at the head and color of its face, another observes the neck, and the attentions of most are directed to one particular point, and should it please their fancy, they conclude the sheep to be good, while in other parts it may be particularly defective. It is thought by most breeders, that sheep of the same breed, possessing the finest wool fatten the quickest; I have stated before, that it is essential for sheep to be covered with wool about the head and particularly between the ears, as a protection against the fly, which otherwise much annoys them; in addition to which, I like to see a tuft of wool on the forehead, also the belly should be well covered beneath, down to the hock and knee, and I have no objection to see a little on their legs, between the knee and the foot; when they are bare of wool under the belly, it causes a great loss in the weight of the fleece. I have known some flocks where the ewes have been completely deficient of wool under the belly, while in the others, it is rare to see one without it in those parts, this I am confident is attributable to the breed alone.

5. *General Management.*

In treating of the general management of sheep the following subdivisions appear necessary:—

1. Coupling the male and female.
2. The general management till lambing.
3. Keep and treatment a short time before, at, and after lambing, also the usual time of castrating and weaning.
4. The mode of raising artificial feed for sheep and lambs on a South Down Farm.

1. *Coupling the male and female.*—Previous to the coupling of the sheep, the master should examine in the minutest manner, both male and female, but more particularly the male, agreeably to the rules already noticed. Upon examination, he will no doubt, find some great defect in the ewes in some particular part, which should be remedied by putting a ram with them that is well formed in those parts, wherein the ewes are defective, but in doing this, the greatest care must be taken, lest a greater defect be introduced in some other part, from a want of attention to the general formation of the ram. I have frequently known, that whilst the breeder has been attempting to eradicate one defect, a greater has been introduced and it can only be avoided by the greatest care and attention, but should the breeder not have in his possession a ram suited for his purpose, it would be adviseable to hire one of another, who has devoted greater attention to the subject. By this practice, a number of good ram lambs may be produced, and the best should be selected to match with the best ewes, which, if used for two or three seasons, a great improvement in the stock will be manifest. It will then be advisable again to hire, from any flocks better than his own, if this practice be continued a few years, the benefit will be still more striking.

There is one remark however, I would offer to all breeders, "be not too partial to your own sheep," as it has operated much in preventing many from making improvements in their flocks. I would also advise every breeder when he purposes saving ram lambs, to select thirty or forty of his best ewes at the time of putting the ram with them, and should he hire a ram superior to his own, let these selected ewes be put to him and afterwards save the ram lambs from their produce.

It is too frequently the case with shepherds, to save the rams, from ewes which are the best nurses, regardless of their shape or constitution. This should not be done by shepherds, the master should superintend it himself, as it is of the greatest importance; it is very desirable to examine closely both ram and lambs, that they be not yellow uuder the skin, which may always be known by making a small incision under the tail and pressing it between the thumb and finger, when, if yellow they should by no means be used for the purpose of breeding. The incision, which is small, does not injure the sheep. It is always advisable to examine every ram lamb intended to be saved; this is to be done at the cutting time, the part of the tail, cut off should be flayed on the under part, when the same yellowness if their be any, will be observable. Some have attributed this yellowness to disease, and although I am not prepared to deny it, yet I am more inclined to think it hereditary, as I know some flocks one fourth part of which are yellow; and I once knew a ram that was found to be yellow when killed, and nearly one half of its progeny was yellow also; still, I do not deny that in some instances, it may be the result of disease.

In no case should ewes be used for breeding that possess any hereditary disease such as biles about the face and neck, yellowness under the skin, gumminess in the wool, which attracts the fly, without due attention to avoiding these, the defects will increase in the progeny.

I have generally observed that ewes struck with fly one year, are invariably so the next, and will continue so. for suceeeding years, they should therefore be withdrawn from the flock, unless possessing very excellent qualities and great merit in shape.

2. *The general management, till lambing.*—The rams in Sussex are put with the ewes during the last fortnight in October or the first week in November, they are generally suf-

fered to run with the ewes for about five weeks. Some are so particular, as not to let two rams run together, but allot a certain number of ewes to each ram, this however cannot be done on some farms where there are but few enclosures, but it is practicable in many instances, and I strongly recommend its adoption as by so doing the ewes and rams will do better, and the produce of each ram, will be distinctly known. I advise keeping the ram and ewes together for three weeks. This I know is objected to by some, as it happens at a time when manure is wanted for the wheat crop, and they loose the fold for three weeks which is a great consideration with many. At the expiration of three weeks, the whole flock may be put together and folded as usual, as the ewes will by this time have conceived, it will be adviseable however to leave two or three rams in the flock for about a fortnight. The term of gestation with ewes is twenty-one weeks.

3. *Keep and treatment of the ewes, a short time before, at, and after lambing, also the usual time of castrating and weaning.*—If it is wished that the ewes should throw doublets, (twins) they should be kept better than usual, before, and at the time the ram accompanies them, but if the land is not such as to enable the breeder to keep the ewes (that produce twins,) better than the general flock while they suckle, it is not desirable to attempt to have twins by that means. Another mode may however be adopted, that is by saving twin ram lambs; experience has satisfied me that a ram which may be a twin, would get double the number of twin lambs than other rams. Twin getting is hereditary in the rams as well as in other branches of the brute creation.

Care should be taken that the ewes are not supplied too plentifully with keep for three or four weeks previous to their lambing, as if they are in a too thriving state at the time of lambing, their blood becomes inflamed, and gangrene, frequently follows in a few days after parturition. The shepherds generally fall into the mistake of supposing that if the ewes are not kept rather better a short time before lambing they will not have so much milk for their young.

If the ewes are put into a barn or yard during lambing (in the night time) care should be taken that their after births should be cleared carefully away and buried, as I have reason to suppose, that becoming putrid, they will inoculate the parts when a ewe is in the act of lambing.

The ewe when in pain will frequently raise herself up and afterwards sit down on her breech, when the putrid substance comes in contact, it may cause gangrene in the ewe, under this conviction I was very particular in making my shepherds take away the cleansings every morning after turning the ewes from the yard. There is another caution which should be given to all young shepherds; if a ewe has difficulty in lambing and requires assistance, force should never be used to bring away the lamb at any other time, than when the pains are on.

The proper age for castration is from eight to twelve days old. I would not advise the operation by any means before the lambs are eight days old, as the parts are too tender and liable to rupture, and if more than twelve days old, the sufferings are greater. The deaths caused by this operation are astonishingly few; when performed skilfully not more than one in a thousand. It is done by two people, the one taking one fore and one hind leg in each hand and holding the lamb against his right shoulder or rather on the shoulder, the other with a pair of large scissors cuts off about one third of the scrotum and presses the testicles forward between his two fore fingers and his thumb and draws them out with his teeth, pressing the string or spermatic cord hard upon the brim of the pelvis, the second finger of the operator is placed before the thumb to prevent the cord cutting the belly and causing a rupture, which may be avoided by carefully drawing the cord in the direction of the spine.

This is a severe operation for the poor lambs but the pain soon ceases, and the lambs in one hour afterwards appear as lively as if this operation had not been performed. Sometimes however, one or two may walk stiff with their hind legs the following morning, this is produced by a small portion of blood coagulating in the scrotum, in which case the lamb should be caught and the orifice opened and the blood pressed out, when a cure is generally effected. During the night after the operation, the lambs should be confined in a warm close or yard, as cold is particularly injurious to all young animals in this state.

4. *The mode of raising artificial food for sheep and lambs, on a South Down Farm, &c,* Having already given my opinion of the proper mode of keeping ewes a short time before and after lambing, I will now state what I conceive to be the best means of raising artificial food for sheep and lambs and the application of the same.

The usual food given early in the spring and after lambing, is rye, which should be sown in September, on a clean fallow, if a good crop is expected. This crop will be fit for feeding ewes in the month of April, soon after lambing, but I do not recommend sheep being fed on this food many days together without other food being given them, for I have noticed, that if the crop be good it will cause the ewes to scour and often cause death.

I would therefore recommend the ewes being put on rye once or twice during the day and on old pasture land or rye grass the remainder. The ewes should by no means remain on the rye, during the night. By attending to this, the rye crop will last good until the latter end of May, when it will begin to run to seed or get stalky. After the rye

has been fed sufficiently long, it may be ploughed for turnips or rape. For turnips it should be ploughed three times, the season will be too far advanced for swede turnips, which in this country, should be sown in May, or at the furthest the middle of June. I have often heard as an objection to sowing the seed early in May, that the turnips are liable to mildew, but this I seldom experienced at Glynde. After the rye is finished, rye grass follows, which is the soundest food we can give and which with the food the Downs supply, will afford sufficient for the flock until the latter end of June, when winter tares will in rotation be ready to feed off, these may be sown from the beginning of October till the beginning of May following, so as to come in one sowing after the other. After tares the next artificial food is clover or rape (called in some counties cole.) Tares, clover, and rape, are usually sown preparatory to wheat. On some farms tares are thought not so good a preceeding crop to wheat as rape and clover. Every farmer must consult the nature of his soil, as what may be the best preparatory crop on one farm, will be the reverse on another.

On all South Down farms more turnips should be sown than there usually are for winter keep for sheep, being likewise useful in the yard as food for working oxen and young stock, and the swedes will last till the time of lambing; but I do not recommend swedes to be given *after* lambing if there is any other feed, as it has been found that lambs do not do well when the ewes are kept upon them.

Sainfoin likewise is, I think, not sown on South Down farms to the extent it ought to be. I do not recommend saintfoin for fresh broken up land, as it seldom does so well as on such as have been under cultivation. Clover will not do to repeat more than once in seven or eight years. The cause has not in general been assigned, my opinion, however, is that the plant is generally destroyed by an insect, which feeds on the roots when sown once in four or five years, or oftener, this insects propagates its species so rapidly as to destroy the plant. The destruction made by them usually commences in the months of April and May, and may be observed by walking over a field; the plants will be seen to perish in patches, and if the plant be pulled up the tap-root evidently has been eaten by some insect. The patches will increase very rapidly, and will soon extend over the whole field. I know of no remedy to prevent the devastation, but by frequent ploughings and the cultivation of other crops, the insects appear to be destroyed, or so weakened in the course of years, that the next time clover is sown it succeeds very well. It is evident that clover is the natural food of this insect, its ravages being never observable in other crops.

REMARKS ON SORTING SHEEP.

There is no practice in breeding which requires more attention than this, or that better remunerates the breeder for his skill and judgment. A few years back but little attention was devoted to the sorting of sheep, or where it was, it was chiefly left to the shepherd (the master only requiring a certain number), and all who have conversed much with the South Down shepherds, are well aware of their partiality to the flock they have followed for years. Their ideas of perfection therefore seldom extend beyond their own flock, and to this must be attributed the South Down Sheep not generally making more progressive improvements.

I have before recommended the system of keeping ewes in lots of eighty or one hundred to one ram, as by marking the lambs as soon as dropt, it will be no difficult matter to ascertain the excellences of the produce of each ram; in marking, to distinguish the various breeds, tiver may be used. One may be marked on the neck, another on the rump, back or shoulders, one on the right shoulder, right side, or right hip, and for variety they may be similarly marked on the left side, by which ten distinct marks may be gained; and at the time of cutting, each lamb should have the ear mark of the sire, a register of ear marks will then enable the breeder at any future time to ascertain the origin or pedigree of any sheep; but this applies only to the ewe and ram lambs, the wethers being sold at the fairs when about six months old.

The ewe lambs kept for stock, may be taken apart two or three times previous to being put with the rams, by which may be discovered the best of each rams produce. By judiciously selecting both rams and ewes in this manner, in a few years the breeder will find himself amply repaid for his trouble.

MANAGEMENT AS TO KEEP, &c. TO AVOID DISEASE.

To prevent many disorders which afflict sheep, it is necessary to keep them in an equal state of flesh throughout the year, and not as is the practice of some flock-masters, who at one season to make their sheep half fat, and at another time half starve them; such management necessarily injuring both their constitution, and the quality of their fleece. To avoid these evils, therefore, is a consideration of very great importance, and requires considerable attention and perseverance on the part of the owner, who should always raise a sufficiency of keep for the flock throughout the year. On those farms where the flocks are supported by artificial food, it requires no little care and forethought in the management of the crops, so as to have regular supplies. But where the advantage of feeding from the Down occurs, it is a matter of far less difficulty.

DISEASES OF SHEEP.

BLOWN OR HOVEN.

This complaint often happens both to cattle and sheep, but more frequently to the latter, when feeding on clover, tares, rape, and turnip tops, but it rarely affects sheep when feeding on common grass, rye grass, or saintfoin. In this complaint I differ as to its cause very materially with most of my friends, who believe that this accident occurs more generally on a wet day than a very dry one; but by experience, which is the best test in such matters, I do not recollect ever having a sheep blown on a wet day, or early in the morning while the dew remained upon the food, and therefore from this inference, I conclude that this accident does not arise either from the moisture contained in the plants, or from eating any quantity of food in such a state. As an instance of which, I may mention what happened to a friend of mine who complained almost every day of losing some of his flock by becoming hoven. This gentleman was in the constant habit of turning his sheep upon green food in the afternoon, I accordingly advised him to prefer the morning when the dew was upon the food, and since he adopted that practice his sheep were invariably free from the accident; contrary, therefore, to the generally received opinion of the moisture causing hoven sheep, I believe it rather to assist digestion than otherwise.

It was an ancient practice when sheep or cattle were blown or hoven, to drive them as fast as they could, under the idea that by such treatment they would discharge the wind from their stomach; but it is my opinion they should remain perfectly quiet, as by beating the animal the air would expand the more.

(Under neat cattle, page 380, will be found the treatment of this affection, to which we must refer our readers.—Ed.)

THE BLOOD, OR WHAT IS IN SUSSEX CALLED THE POOKE.

This complaint is certain death when it attacks either sheep or neat cattle, I know of nothing that can be done to remove this complaint, sheep of all ages are liable to the *blood*. It more generally affects young animals in neat cattle, than those more advanced in age, and calves of less than a year old than others, though I have sometimes seen instances of neat cattle of two or three years old, which have died of this disorder.

All that can be effectually done in this disease, is to prevent rather than cure; but to avoid its effects it is necessary to discover the cause, which in neat cattle is frequently poor pasture, or sudden change of food, but cattle on some particular farms are more subject to the disorder than others. To prevent it in calves, they should be bled copiously when about eight or nine months old, and some breeders in addition give them a cleansing drink.

In sheep the disease generally originates from being kept better than usual, or when in a thriving state being suddenly fed on richer or more forcing food than common; such as upon rape, which, in my opinion, is the most forcing food of all the green crops; I have known flocks when feeding on rape to be taken suddenly ill, and many have died before bleeding could be resorted to, but after the flock had been bled the remainder have remained unaffected. This complaint is the effect of inflammation, and if the part affected be immediately after death deprived of the skin it will appear bloody, and if the skin be not taken off for ten or twelve hours after death, the flesh becomes putrid and offensive.

I should therefore recommend to all sheep-masters whenever they have a sheep die with the blood, to have the remainder immediately bled, and if possible to put them on some other food for a few days, or give their present food more sparingly.

THE ROT.

This disease is seated in the liver, and when a sheep is opened that is affected with it, a number of small animalcules will be found in the ducts of the liver. They are first formed in the larger or gall duct, from whence they spread themselves into the smaller ducts, and ultimately destroy the liver. The differences of opinion as to how they are generated or produced are diametrically opposed one to another, but I believe it to be caused by the sheep feeding on wet pastures during the months of June, July, August, September, or October, or even until there happens to be one nights hard frost, not covered with snow, which destroys whatever it is that causes the disease. I believe some old shepherds imagine a plant called spearwort causes the insect, and I will not say but that eggs of insects may be deposited on the leaves, but no one, I think, can conclude that a vegetable can possibly be converted into an animal.

The ravages which this disease has made among sheep during the last two or three years, ought to be a sufficient inducemement for every flock-master, to endeavour to discover its cause.

It is more easy to prevent than to cure any disease, and with respect to the rot I believe there is no cure known; it may, however, be arrested in its progress for a short period, but it must ultimately destroy the animal.

The supposition that a ewe would not take the rot while suckling her lamb is altogether erroneous, and I believe that *any* ewe suckling her offspring during the months before mentioned, and put upon land calculated to cause rot, in other sound sheep, would become rot also.

'About forty or fifty years back, a person from the neighbourhood of Farnham, by the name of Fleet, advertised a discovery he had made to cure rotten sheep, I therefore made a trial, as I was always desirous of doing with any discovery, to prevent the ill effects of this alarming disease. The season was wet and numbers died, I therefore had no difficulty in collecting one hundred sheep from my neighbours in a very diseased state, having none myself but what were perfectly sound. Upon collecting this number of diseased sheep, I sent to Mr. Fleet informing him what I intended to do, and wishing him to meet me at my farm at Glynde.

The sheep were most of them in a most wretched state of disease, and three or four died before any medicine was given. Mr. Fleet did not come but sent a neighbour, the next morning a drink was given, which consisted chiefly of turpentine, some died that day and in the night following. The next morning another dose was given of about a large wine glass full, and the dose repeated on the third morning; several however died after the second dose. I examined those that died, and I believe that many of the flukes were dislodged from the liver and driven to the intestines, and some were even voided. After the third dose several more died, but upon examination most of the flukes were on the surface of the liver, and completely driven from the ducts, but they evidently were either too large to get through the gall duct, or else the medicine did not reach them; after three days more I returned all that were alive (about seventy in number) to the different owners, with a request that they would not keep them as store stock, but fatten them, and report to me the state of the livers when slaughtered, which they accordingly did. The livers were found to be very pale, but perfectly free from flukes, and had fattened very well.

As wetness of land causes the rot, it is advisable and I strongly recommend all breeders who have wet lands, to have them thoroughly drained, which will materially act as a preventative. Some have contended that salt will cure the disease, this I do not believe, but I think it will act as a preventative, and have therefore given it to my sheep in troughs. I know some farmers who have used rock salt, which has been placed in the field where the sheep feed, on three sticks, constructed somewhat like the scheme adopted by the beggars in hanging their kettle, the salt being placed on the top of the sticks about two and a half or three feet above the ground, to this the sheep will be frequently seen to go and lick.

The sheep when kept on turnips should have hay, pea straw if harvested well, or barley straw, to counteract the excessive moisture of the turnips.

SCAB OR MANGE.

This disease never affected my sheep, and therefore I know but little about its cause or effects. The sulphur ointment, recommended for the horse, page 601, is a good application when reduced to half its strength.

THE TICKS.

Young sheep are more troubled with these insects than older ones; to prevent their attack, the lambs about the months of August or September should be dipped in the following mixture:—Put six gallons of water into an iron kettle and place it over a fire, when it is warm add two pounds of soft soap and one pound of arsenic; the soft soap should remain in the water till dissolved, before the arsenic is added, and the whole should be well stirred; when the arsenic is sufficiently incorporated with the water and soap, let twenty-four gallons of cold water be put into a tub, then take six gallons of the ingredients from the kettle, and pour that into the tub, the whole then again being well stirred. In using the above there should be two tubs, one for dipping the lambs into, and another to catch the drainings from the fleece after being dipped. The process of dipping requires one man to take hold of the hind legs and another the fore legs, immersing the lamb with its back downwards, taking care that its head is kept from going under the mixture; the lamb need not remain in the tub longer than is sufficient to well wet the wool, it is then lifted out and put on its back, on a cradle over the draining tub. The cradle is made with two sticks or cord bats, rather longer than the tub is wide, tied together in five or six places for the lamb to lie on to drain, and while in this situation the mixture is to be pressed from the wool as much as possible. To prevent the loss of the mixture the tubs should be kept pretty close together. Four men are constantly employed in this operation, two to dip, while the other two are occupied at the draining tub.

The above quantity of mixture will be sufficient for thirty lambs. The mixture in the dipping tub should be frequently stirred about to prevent the arsenic falling to the bottom. It will likewise be necessary to keep the dipping tubs nearly full, which may always be done by adding some of the solution as it is taken out. Brewing tubs should not be used, nor should the mixture by any means be left about after the operation is over, as it is both poisonous to man and beast, and will even destroy grass when poured upon it.

In dipping ram lambs, care must be taken that the purse be not wetted, as I have seen when this has been disregarded, the testicles swollen to a very enormous size, frequently causing great alarm, and the effects of which have been felt for days after.

THE GID, WATER IN THE HEAD OR WHAT IN SUSSEX IS CALLED PODDERISH OR POTTERISH.

Various opinions are extant as to the cause of this disease, it generally attacks sheep of a year or a year and a half old, and what is singular, sheep turned eighteen months, rarely, if ever, suffer from it. The disease may be known by the sheep separating from its companions, appearing dull and heavy, and alarmed on the slightest interruption, afterwards the sheep holds its head on one side, and in the course of a few weeks, the sheep will on occasions suddenly turn round, either to the right or left, inclining the head from the seat of the disease!

This disease is thought by many to be hereditary, but I am of a different opinion, although I have known some farmers loose more sheep than others, and have known them, therefore under this impression purchase lambs from other flocks less liable to the Gib, but in doing so, they have ultimately sustained considerable loss. I am therefore inclined to conclude that some insects get into the lamb's nostrils at an early age before the parts are closed and deposit their eggs on one side of the brain, for I have seen on opening a sheep's skull thus affected, insects not unlike a wood louse, in different parts of the brain. I do not advise any attempts to be made to cure this disease, if any means are adopted they must evidently be both painful and very uncertain. I have had many trepanned, and they have afterwards lived for months, or rather dragged on a miserable existence, evidently deprived of their senses. I have known it said, that by taking hold of both ears and shaking the animal's head violently, a cure has been effected and likewise by perforating the skull to let out the water, but all have been vain, and I should therefore advise flock masters as soon as the diseased lamb is discovered, to have it slaughtered.

THE FLY.

Price speaking of this, says, " the fly may more properly be termed an injury, than a disease, as it may in general be prevented by moderate attention.

There are two or three sorts of flies, that are said to strike sheep, viz. the black, white and greenish fly. The maggots generated from the ova of the first or black fly are deemed the most destructive to sheep. This fly is later in making its appearance than either of the others, I have heard it asserted by an experienced breeder, that a considerable difference is observable in the appearance of the maggots, those from the white and green fly, being white, while those of the black fly partake of a black color. Sheep that have once been struck with the fly, are more liable than others to be attacked on the following year, as are also such as have a foul skin.

This injury may sometimes be discovered from the marks left on the skin by the blows of the fly, but when such marks are not present it is readily discovered by the motions and appearance of the animal.

A sheep troubled with maggots, betrays constant uneasiness, it hangs down its head and appears in a listening posture, it moves its tail in a peculiar manner, draws up its body, stamps its feet, runs a short way, and then suddenly stops and frequently attempts to tear or bite the injured part.

As soon as the symptoms show themselves, the wool should be removed from the part with the shears, and afterwards the maggots carefully picked out, this and rubbing a little grease on the wound, is the only method they have recourse to, at Romney marsh. In very bad cases, spirits of turpentine, white lead, train oil, and assafœtida, have all been recommended, and I have no doubt all prove noxious to these vermin.

Some graziers recommend goulard water, as a wash for the affected parts, and others a mixture of train oil and brimstone ; but the best remedy I am acquainted with and that which proves least injurious to the wool, is an ointment composed of the flowers of sulphur and butter or lard, a sufficient quantity of which should be well rubbed in with the hand.

It is my opinion, that a sheep once struck should never be kept to breed from, as they are nearly certain to be struck again with the fly the next year, I would not even save a lamb from a ewe that had been struck, as it originates, I believe generally from a foulness of the wool attracting the fly. By attention and close watching, I rarely had a sheep struck with the fly at Glynde, and I am persuaded it always prevails to a greater extent in those where little attention has been paid to breeding, and especially from sheep once struck.

In enclosed situations, I have known sheep affected with the fly, and particularly those which are not well covered with wool between the ears. Having bred away this and other defects, few of my sheep have ever been attacked.

PURGING OR SCOURING.

This proceeds from various causes. Sheep of a degenerating constitution, and those which have been removed suddenly from poor to rich keep, are most liable to be affected with this disease. Dry pasture and dry food, such as hay and corn, is most likely to have the best effect in recovering them. This disease sometimes is occasioned from feeding on stale pastures, that have been long stocked with sheep, or from a want of change of keep, Sheep affected with this disease as well as most others, should never be used for breeding, but rather to fatten early for market.

DROPSY AND RED WATER.

The Dropsy is caused by sheep being kept on too succulent food, without having a due proportion of hay, or some other dry food to counteract the moisture contained in it; young green oats alone are particularly pernicious to sheep, they eat them greedily and not unfrequently die of the red water, if suffered to remain long on them. Sheep fed on turnips in a wet autumn without dry food, are likewise often affected with the dropsy.

THE FOOT ROT AND KIBE.

The Foot-rot is very prevalent with some breeds of sheep, and probably is more to be attributed to the land on which they are kept, than to any other cause. It is very troublesome, but is rarely known to affect the South Down Sheep. The disease is contagious and therefore whenever one sheep is afflicted with it, it should be immediately taken from the rest, and put into some dry pen and dressed with the following composition :—

Green Copperas	4 oz.
Green Vitriol	4 —
Sugar of Lead	2 —
Verdigris	3 —
Saltpetre	2 —
Turpentine	½ a pint.
Strong Vinegar	1 pint.
Oil of Vitriol	½ pound.

Put the ingredients into a bottle and after being well shaken the mixture will be fit for use.

The first thing to be done is to cut away the foul part between the claws, and rub the part well with a linen rag, by drawing it between them, and if the parts bleed, it is much better, after this apply the above mixture twice a day till the cure is effected, which will not be prolonged beyond two or three days. I have known the butter of antimony used by itself and answer well. This disease is very different from the Kibe, as it generally shows itself between the claws, while the Kibe is a breaking out at the top of the hoof, or between the hair of the hoof. I consider the Kibe to be also contagious, and all sheep attacked with the disorder, should, upon discovery be removed from the flock into a dry pen and the parts dressed with the following mixture :—

Half a pound of Soft Soap,
Half a pound of Resin,
Quarter of a pound of Venice Turpentine.

Heat the above over a slow fire until the resin and soft soap be melted, then incorporate the turpentine by stirring the whole together, while over the fire.

After the scaled parts have been rubbed off in the manner directed, the above is to be applied and the affected part covered round with a piece of linen rag, with two or three dressings the disease will be in most cases cured, and in a short time after the sheep may be turned with their companions. I have little doubt but what this disease is nearly as infectious as the foot rot, and that the land on which such diseased sheep are kept, becomes impregnated with the infection, and any sound sheep driven thereon, will in a short time, become diseased.

I would strongly impress on the minds of all flock masters, the necessity of an occasional change of food, especially when flocks are kept chiefly on the artificial kind, as the sheep under such management, do better and are less afflicted with disease.

Having thus made a few general observations upon the principal diseases to which sheep are liable, I shall conclude with a few remarks on two very pernicious weeds, viz. Charlock (*Sinapis Arvensis*), and Poppy (*Papaver Rhœas*,) which are frequently eaten by lambs while feeding on green crops.

I have known many sheep lost while feeding off tares, in the months of June and July, where the land is much over-run with charlock, and particularly when the plant is in full blossom, on which the lambs then frequently feed. I regret, however to say, that in this neighbourhood, the farmers are more inclined to encourage this plant than to destroy it. Although it might be very readily eradicated, yet, some from having it constantly in their crops, become so habituated to its appearance as to suppose it perfectly harmless. On some farms, this weed grows so abundantly, that I am sure one fourth of the crops are lost by suffering it to increase.

The poppy is another weed to be guarded against. I have frequently seen its ill effects upon lambs, particularly such as have been put upon saintfoin containing it. The sheep partaking of this weed are generally overtaken by a sudden stupor, some of which do not recover for months, while others die, or become exceedingly poor and debilitated. I have frequently been applied to in such cases and have invariably given it as my opinion that the poppy had done the mischief.

SOIL.

Few subjects can be of more importance to the agriculturist than a knowledge of the qualities and properties of the soil on which he operates; and on the proper cultivation of which his future hopes and prospects so materially depend.

Soils are so extremely varied, both in their composition, and in the proportions of their component parts, that certain plants will grow, and even luxuriate, in one soil, that will scarcely exist in another; a knowledge, therefore, of their peculiarities cannot but be interesting to the farmer, and chemical investigation can, alone, enable him to ascertain these peculiarities with accuracy and precision.

The *composition*, and *analysis* of soils, have been already adverted to under Chemistry, and we shall here subjoin the rules, laid down by Sir H. Davy, for the improvement of soils, as connected with the properties of which they consist.

In ascertaining the composition of sterile soils with a view to their improvement, any particular ingredient, which is the cause of their unproductiveness, should be particularly attended to; if possible, they should be compared with fertile soils, in the same neighbourhood, and in similar situations, as the difference of the composition may, in many cases, indicate the most proper methods of improvement. If, on washing a sterile soil, it is found to contain the SALT OF IRON, or any acid matter, it may be meliorated by the application of *quick lime*, which converts the sulphate into a manure. If there be any excess of CALCAREOUS MATTER in the soil, it may be improved by the application of *sand or clay*. Soils, too ABUNDANT IN SAND, are benefitted by the use of *clay or marl*. or *vegetable matter*. A field belonging to Sir Robert Vaughan, at Hannan, Merionethshire, the soil of which was a light sand, was much burnt up in the summer of 1805; Sir Humphry Davy recommended to that gentleman the application of peat as a top dressing. The experiment was attended with immediate good effects. A DEFICIENCY of ANIMAL or VEGETABLE matter must be supplied by *manure*. An EXCESS OF VEGETABLE MATTER is to be removed by *burning*, or to be remedied by the application of *earthy materials*. The improvement of PEATS or BOGS, or MARSH LANDS, must be preceeded by draining; stagnant water being injurious to all the nutritive classes of plants. SOFT BLACK PEATS, when drained, are often made productive by the mere application of *sand or clay*, as a top dressing. When peats are acid, or contain ferruginous salts, calcareous matter is absolutely necessary in bringing them into cultivation. When they abound in the branches of roots of trees, or when their surface entirely consists of living vegetables, the wood, or the vegetables must either be carried off, or be destroyed by burning. In the last case, their ashes afford earthy ingredients, fitted to improve the texture of the peat.

The power of absorbing and retaining heat and moisture, seem to be closely connected with the fertility of the soil. Certain soils are more easily heated than others, and when brought to the same degree of heat, cool more rapidly. A soil of a stiff white clay is heated with difficulty; and from the moisture it contains, retains the heat but for a short time. A chalk soil is also heated with difficulty; but containing less moisture, the heat is retained for a greater length of time. A black soil, in which soft vegetable matter is predominant, is most heated by the sun and rain. Deep coloured roots, and such as contain a large proportion of carbonaceous and ferruginous matter, exposed to the sun, acquire a higher temperature than soils of a pale colour. The temperature of the soil, or its power of combining with, and retaining heat, is greatly modified by the property of absorbing and retaining moisture; and the power of the soil to absorb water, depends in a great measure on the state of the division of its parts; for the more they are divided, the greater is its absorbent power. This power is greater in vegetable than in animal substances; the latter possess it in a higher degree than compounds of the earths, and a considerable diversity prevails in the different proportions of the earths themselves. The fertility of a soil much depends on its power of absorbing water from the atmosphere; and the most fertile soil always absorbs it in the greatest degree. Experiments can be easily made to ascertain this property; so that it affords a simple method of determining the fertility or barreness of the land.

The productiveness of soils must likewise be influenced by the nature of the subsoil, or the earthy or stony strata, on which they rest; and this circumstance ought to be particularly attended to, in considering their chemical nature, and the system of improvement. Thus a sandy soil may owe its fertility to the power of the subsoil to retain water: and an absorbent clayey soil may occasionally be prevented from being barren in a moist climate, by the influence of a substratum of sand or gravel. Those soils that are most productive of corn, contain always certain proportions of aluminous or calcareous earth in a finely divided state, and a certain quantity of vegetable or animal matter. The quantity of calcareous earth is, however, very various, and in some cases exceedingly small. A very fertile soil from Ormiston, in East Lothian, afforded in a hundred parts only eleven parts of mild calcareous earth; the finely divided clay amounted to forty-five parts. It lost nine in decomposed animal, and vegetable matter, and four in water, and exhibited indications of a small quantity of phosphate of lime. This soil was of a very fine texture, and contained very few stones, or vegetable fibres. It is not unlikely that its fertility was in some measure connected with the

phosphate, for this substance is found in wheat, oats, and barley, and may be a part of their food. A soil from the low lands of Somersetshire, celebrated for producing excellent crops of wheat, and beans, without manure, was found to consist of one ninth of sand, chiefly siliceous, and eight ninths of calcareous marl, tinged with iron, and containing about five parts in the hundred of vegetable matter. No phosphate or sulphate of lime could be detected in it, so that its fertility must have depended principally upon its powers of attracting principles of vegetable nourishment from water and the atmosphere. Mr. Tillet, in some experiments, made on the composition of soils, at Paris, found that a soil composed of three eights of clay, two eights of river sand, and three eights of the paring of lime stone, was very proper for wheat. In general, bulbous roots require a soil much more sandy and less absorbent than the grasses. A very good potatoe soil, from Varsel, in Cornwall, afforded seven eighths of siliceous sand; and its absorbent power was so small, that 100 parts lost only two by drying, at 400 Fahrenheit.

Plants and trees, the roots of which are fibrous and hard, and capable of penetrating deep into the earth, will vegetate to advantage in almost all common soils that are moderately dry, and do not contain a very great excess of vegetable matter.

The soil taken from a field at Sheffield Place, in Sussex, remarkable for producing flourishing oaks, was found to consist of six parts of sand and one part of clay and finely divided matter. And 100 parts of the entire soil, submitted to analysis produced water 3, silex, 54, alumina, 28, carbonate of lime, '3, oxide of iron, 5, decomposing vegetable matter, 4, loss 3. From the great difference of the causes that influence the productiveness of lands, it is obvious, that in the present state of science, no certain system can be devised for their improvement, independent of experiment, but there are few cases in which the labour of analytical trials will not be amply repaid, by the certainty with which they denote the best methods of melioration, and this will particularly happen when the defect of composition is found in the proportions of the primitive earths. In supplying animal or vegetable manure, a temporary food only is provided for plants, which is, in all cases, exhausted by means of a certain number of crops; but when a soil is rendered of the best possible constitution, and texture, with regard to its earthy parts, its fertility may be considered as permanently established. It becomes capable of attracting a very large portion of vegetable nourishment from the atmosphere, and of producing its crops with comparatively little labour and expence.

The best natural soils are those of which the materials have been derived from different strata: which have been minutely divided by air and water, and are intimately blended together, and in improving soils artificially, the farmer cannot do better than imitate the processes of nature. The materials necessary for the purpose are seldom far distant: coarse sand is often found immediately on chalk; and beds of sand or gravel are common below clay. The labour of improving the texture or constitution of the soil, is repaid by a permanent advantage; less manure is required, and its fertility insured. And capital laid out in this way secures for ever the productiveness and consequently the value of the land.

Much information can be obtained, regarding the nature and qualities of soils, from the indications afforded by their spontaneous produce; several interesting communications upon this subject have appeared in the "Transactions of the Highland Society of Scotland" and in the absence of *chemical investigations*, the following remarks, by Dr. Singer, will, it is presumed be found useful. An arable field, covered with a strong crop of rag-weed, (*Senecio Jacobea*,) will be found to consist of good loam, fit for any crop, and not properly stocked in pasturage, unless there be such a proportion of sheep as to eat and keep down this rank weed, for which the new Leicester, or Dishley breed, is well adapted. A forest of way-thistles, (*Carduus Arvensis*) indicates a good, rather strong soil, neglected and wanting to be drained and cleaned. The meadow-thistle (*Carduus palustris*) grows in lands adapted to meadow-grass. Common docks, (*Rumex obtusifolius*) with mug wort (*Artemisia vulgaris*) infest good soils, in places not correctly cultivated. Sorrel (*Rumex Acetosa*) abounds in light soils; and corn sow-thistle (*Sonchus Arvensis*) in clay soils, not properly cleared of weeds when in culture. Dead nettle (*Lamium purpureum*) wild kale (*Raphanus Rhaphanistrum*), and corn marigold (*Chrysanthemum Segetum*) may be expected in light soils, imperfectly cleared and laid down. Corn spurry (*Spurgula Arvensis*) is found most frequently in soils, rather moist, and not completely fallowed. The great white ox eye (*Chrysanthemum Leucanthemum*) which is a congener of the corn marigold, but a more pernicious weed, being a perrenial continues to grow in light soils, in which it has got a place, and from which it has not been extirpated. The common nettle (*Urtica urens*) is very seldom if ever found, excepting in places where man has inhabited, and it commonly appears in a loamy soil. The wild mustard (*Sinapis arvensis*) appears in good soils, where there is plenty of manure. When chickenwort grows in strength, whatever the nature of the soil is, it shows that it is in a state of improvement, and that when cleaned of weeds, it is fit for bearing crops. In mossy soils, the Yorkshire fog (*Holcus lanatus*) delights, when of a light flowery character, and duly improved; when the moss is more solid, with a mixture of clay, Timothy grass (*Phleum pratense*) prospers; and richly manured, they suit the rough-stalked meadow-grass (*Poa trivialis*); but when rather poor, they still nourish the waving hair grass, (*Aira fleuxosa*) and the sheep's fescue (*Festuca ovina*). Meadows, which in May discover a large quantity of marsh marigold (*Caltha palustris*) or of the wild water-cress (*Sisymbrium Nasturtium*) may be considered fully or over watered. Pastures, in which the white clover and daisy prevail, and

seem to thrive, have been either naturally, or by art, manured with lime or marl; and pastures full of grass; but without these plants require to be so manured, meadows well stocked with natural red clover, (*Trifolium medium*) have calcareous matter already in them. If the (*Achillea Millefolium*) abounds in any pasture lands it shews a deep soil; and the meadow-fox-tail (*Alopecurus pratensis*) indicates a soil deep and moist. The common rattle (*Rhinanthus Christa-Galli*) abounds in exhausted and poor meadow soils, requiring to be manured; and the pry (*Carex dioca*) in meadows below which there is water stagnating and requiring to be drained off.

In lands much cultivated and long cropped, the couch grass (*Triticum repens*) abounds; and this weed is to be got under by clean dressing, and by at least three years of pasturage.

The wild mint, (*Mentha arvensis*) is a great annoyance in gardens and fields long in culture; by due attention to take out the roots in spring, and especially by digging about, or after Lamas it is destroyed. The corn chammomile (*Anthemis arvensis*) occasions great trouble, even in good and well manured, but long cultivated soils; requiring uncommon attention to keep it down, and like the noxious perennial which resembles it in flower, though not in leaf, (the *Chrysanthemum Leucanthemum*) is hardly to be got rid of without correct fallowing and sowing down, followed by hand weeding in the young grass, before these weeds have become strongly rooted, or the seeds of any of them have been allowed to propagate in the grass.

The indications of the soil from spontaneous produce in lands either longer or shorter in tillage, though not very certainly nor clearly made, are in some degree practicable, and will become daily more easy to an experienced and attentive observer.

SPINAGE.

Spinage (*Spinácia Oleracea*) Diœcia Pentandria Linn.; Chenopódeæ Juss.

Spinage is a hardy esculent, too well known to require description, there are only two varieties cultivated.

1. The prickly-seeded, preferred for autumn and winter sowings.
2. The round-seeded, adapted for general summer crops, the leaves being more succulent and tender.

Culture, &c.

SOIL.

Spinage requires a rather light, rich soil, and for early crops, a warm sheltered border is necessary, but for the general summer crop, any open compartment will answer.

PROPAGATED.

By seed sown either broadcast, or in drills, if broadcast, a bed four feet and a half by thirty feet, two ounces of seed will be required, but in drills, one ounce will sow the same space. The ground ought to be thoroughly dug, previous to sowing and the seed sown lightly and raked in about an inch below the surface.

Period of sowing. The time of sowing must necessarily be influenced by the intention of the cultivator, for Spinage is frequently grown for both summer and winter consumption.

For a summer Crop says Abercrombie begin in January if open weather, with sowing a moderate crop of the round leaved. Sow a large quantity in February, and more fully in March. The plants presently run to seed in summer, especially if they stand crowded; it is therefore proper to sow about once in three weeks, from the beginning of March to the middle of April; then every week to the middle of May, from which time till the end of July, sow once a fortnight.

Where it is necessary to make the most of the ground, the spring sowings in February, March, and April, may be made in single drills, between wide rows of young cabbages, beans, peas, or other young crops of slow growth; or they may be made still better on spots intended to receive similar plants, including cauliflowers, horse-radish, &c. The spinage will be off before the slower growing crops are much advanced. Spinage and a thin crop of radishes may be sown together and the radishes will be drawn in time, to give room for the spinage.

Subsequent Culture. When the plants are up, shewing leaves about an inch broad, thin to three inches apart, and when advanced in growth, every other may be cut for use, increasing the distance to about six inches. When the leaves are from two to five inches in breadth, cut the plant clean out to the bottom, or sometimes cut only the larger leaves. But as soon as their is any appearance of their running to seed, they may be drawn clean as wanted.

For a winter crop, sow the prickly seeded variety in the first or second week in August, and a secondary one towards the end of that month to stand later in the spring, until the round spinage come in.

Mc. Phael directs "in the first or second week of August to get a piece of good rich deep ground in readiness by dunging it, if it want, and digging it deep for a crop of winter and spring spinage. When your ground is dug, if it be a light soil, which is best for spinage, tread it with your feet all over, then draw shallow drills of two feet apart, with your hoe flat wise; scatter the seeds of prickly spinage in drills, and cover them two inches deep and make the ground smooth with a rake. You should, before you fill up the drills, set a little stick up at each end of them, that in case of dry weather, you may stretch a line between them, which will show you where the spinage is sown, that you may water the rows if they require it. If the ground was dry on the surface, when you sowed the seed you should have had the drills watered before they were covered. You may sow again a few rows about the twentieth of the month.

Subsequent Culture. When the plants are advancing with leaves an inch broad in September, thin to two or three inches distance. If by October and November, the plants are forward in growth, some may be gathered occasionally, in the larger leaves; or where most crowded, plants may be cut out to give others room. At the end of the winter, thin the plants to seven inches by seven, ten by five, or twelve by four. On a dry day, stir the surface of the mould, if it has been much battered by rough weather. In April or May, the larger plants may be cut out fully for use, clean to the bottom, or drawn, if the ground be wanted: as they will then soon go to seed stalks.

To save seed. Either sow a quantity of each sort for the purpose of spring and autumn, or leave some plants of the autumn or spring sowings; they will shoot up stalks in May and flower in June; when, and not before the male and female plants will discover themselves, the former producing its flower in spikes, with stamina, containing the yellow male farina; the female plants, exhibit flowers in close lateral clusters at the joints of the stalk. Leave the male plants till they have discharged their farina after which they soon decay, but the females continue their growth till they perfect the seed in July and August. Pull up the stalks, spread them out to dry in the sun, and to harden the seed; then thrash it out for use, and keep it, as all other seeds should be preserved, in a cool, dry room, in a drawer or bag.

USE.

The leaves boiled and served up with butter, eggs, and gravies, are greatly esteemed by many.

SPINAGE, (NEW ZEALAND.)

New Zealand Spinage (*Tetragónia Expánsa*), Icosàndria Pentagy'nia Linn.; and Ficoideæ Juss.

There is often considerable difficulty in keeping up a regular supply of Spinage, during the summer season on account of its early tendancy to run to seed; the Tetragonia Expansa, offers an excellent substitute for that vegetable, it is a native of New Zealand, and was found by the Naturalists who accompanied Captain Cook to that country, growing by the side of woods and bushy sandy places and though not used by the inhabitants, was regularly served to the sailors boiled every day at breakfast and dinner. It was introduced into this country in 1771, by Sir Joseph Banks, and treated as a green-house plant, but it has since been found to grow in the open air as freely as the kidney-bean or nasturtiums.

Culture, &c.

SOIL.

A light rich soil is required for the successful cultivation of this plant, and if the ground is not naturally rich, it must be made so by digging a hole and filling it with manure, in the same manner as directed for cucumbers in the open air.

PROPAGATED.

By seed sown towards the latter end of March, in a pot which must be placed in a Melon or Cucumber frame; the seedling plants, while small, should be set out singly in small pots, and kept under the shelter of a cold frame, until about the 20th of May, when the mildness of the season will probably allow of their being planted out, without the risk of being destroyed by frost.

PLANT.

When the young plants are sufficiently inured to the open air, they may be planted in ridges three feet apart. In five or six weeks from the time of planting, their branches will have grown sufficiently to allow the gathering of the leaves for use. In dry weather, they should be liberally supplied with water. They put forth their branches vigorously as soon as they have taken to the ground, and extend before the end of the season, three feet on on each side from the centre of the bed.

In gathering for use, the young leaves must be pinched off the branches, taking care to leave the leading shoot uninjured; this with the smaller branches which subsequently arise from the ulnæ of the leaves which have been gathered will produce a supply until a late period of the year, for the plants are sufficiently hardy to withstand the frosts which kill nasturtians, potatoes, and such tender vegetables.

USE.

The leaves are dressed in the same manner as common spinage and whether boiled plain, or stewed, are considered by some greatly superior.

STRAWBERRY.

(*Fragaria*) Icosàndria Polygy'nia; Linn. and Rocáceæ, Juss.

The strawberry is one of the most wholesome and delicious summer fruits, and as it never undergoes the *acetous fermentation,* seldom disagrees with the most delicate stomach; under proper management, its cultivation is both simple and easy, and when thus managed, will amply repay any trouble or pains taken in its cultivation. In the choice of sorts, some difficulty obtains in making the best selection, as the varieties and synonymes are both numerous and extensive. Mr. Barnet has described no less than 54 varieties, in the sixth vol. of the Transactions of the Horticultural Society of London, and adds that when the whole shall have been described, he entertains no doubt that the list may be extended to near one hundred kinds. In the subjoined list, which may be deemed a good selection, care has been taken to append the synonymes to every variety, to prevent, as far as possible, either confusion, or disappointment, in their purchase or cultivation.

SCARLETS,

The character of this class is to have the leaves nearly smooth, dark green, thin texture and sharp pointed serratures. Fruit, small size, bright color, seeds more or less deeply embedded, with ridged intervals. Flavor, acid, with slight perfume.

1.	Old Scarlet,	*Synonymes*	Scarlet, early scarlet, original scarlet, virginian, scarlet virginian.
2.	Roseberry	———	Rose strawberry, Scotch scarlet, Aberdeen, Aberdeen seedling, prolific pine.
3.	Carmine scarlet	———	Carmine roseberry.
4.	Grove end	———	Atkinson's scarlet.
5.	Duke of Kent's	———	Globe scarlet, prolific scarlet, early prolific scarlet, Nova Scotia scarlet, cluster scarlet, Austrian scarlet, oatland's scarlet, Duke of York's scarlet.
6.	Grimstone.		
7.	American	———	Black American.
8.	Hudson's Bay	———	York liver scarlet, American scarlet, late scarlet, Hudson's pine.
9.	Cocks'comb.		
10.	Wilmot's late scarlet	——	Wilmot's scarlet, Wilmot's new scarlet, Wilmot's seedling, large virginian, late virginian.

BLACKS.

Character, leaves rugose, pale green, and small, fruit middle-sized, conical with a neck very dark colored, seeds slightly embedded, flavor very rich, and highly perfumed.

1.	Pitmaston.		
2.	Downton	*Synonymes*	Knight's seedling, Knight's strawberry.

PINES.

Character, leaves almost smooth, dark green, firm texture, with obtuse serratures, fruit large, varying from nearly white, to almost purple; seeds prominent on a smooth surface, flavor sweet and often perfumed.

1.	Bostock	*Synonymes*	Rostock, rostock seedling, rostock scarlet, rostock pine, Whitley's pine, Wellington cone, Byram Caledonian, Vernon's Montague's, prolific Bath, new Bath, Beattie's seedling.

2.	Surinam	*synonymes*	Red pine, Oldaker's new pine, red pine apple, Sutton's large.
3.	Old pine	———	Pine, scarlet pine, old scarlet pine, Devonshire scarlet pine, blood pine, large pine, Kew pine, Windsor pine, Cock's-comb pine, Carolina, old Carolina, large Carolina, black Carolina, Miss Gunning's north's seedling, varnished, Barham Down, Regent's favorite.
4.	Keen's seedling	———	Keen's new seedling, Keen's new pine, Keen's black pine.
5.	Round white Carolina		
6.	Knivett's new pine		

CHILIS.

Character, leaves very villous, hoary, leaflets small, thick texture and very obtuse serratures, fruit very large and pale, seeds prominent, flesh insipid in the type.

1. Wilmot's superb
2. Yellow chili

HAUTBOIS.

Character, leaves tall, pale green, rugose, thin texture, scapes tall and strong, fruit middle sized, pale, greenish white, tinged with dull purple, seed slightly embedded, flavor musky.

1.	Prolific hautbois	*Synonymes*	conical, hautbois, double bearing, hermaphrodite, Hudson's Bay, musk, Regent's dwarf, sacombe, Sir Joseph Bank's, spring grove.
2.	Large flat hautbois	———	White, Bath, Salter's, Formosa, Lowder's Weymouth.

ALPINE AND WOOD STRAWBERRIES.

The general character of these are very similar, the *shape* of the fruit constituting the principal difference. In the alpine it is *conical,* in the wood *globose.* The Alpines produce fruit during the autumn, and in mild seasons, till near Christmas. The wood bear only during summer.

1. White alpine
2. Red alpine, scarlet alpine
3. White wood, white Dutch
4. Red wood, common Dutch

From the preceding list, a good selection may be made, agreeably to the wishes or intention of the cultivator; but where the choice is limited to two or three kinds, the Keen's seedling, roseberry, and red alpine, will probably be selected as the most useful.

Culture, &c.

SOIL.

All cultivators agree that a light rich loam, with a free exposure and depth of soil are essential to the successful cultivation of the strawberry. It is not generally known, but it is an ascertained fact, that most strawberries generate roots, and strike them into the ground nearly two feet deep, in the course of the season.

PROPAGATED.

By seeds and by runners. The plant, while it is bearing, sends forth runners along upon the ground. These runners have several joints, and at every joint there comes out a root which penetrates down into the ground. Each of these roots sends up a plant; so that the runner, if it extend to a yard or two, as it frequently will, would produce ten or a dozen plants. All these plants, if cut from the runner, and planted out would grow, but all of them would not bear the first year, if so planted out; the finest, therefore, should only be taken, the *stoutest* and *earliest* being considered the best. With respect to the proper time for the removal of the runners two opinions appear to prevail; the old, and even now, the general custom, is to plant them out in August, while all our best cultivators prefer the month of March, to any other period of the year, the runners being allowed to remain attached to the old plant during the winter season and about the middle of March the best only are selected and planted out where they are finally to remain. In the planting of these off-sets, great care is requisite, the ground should be made rich and fine, and the root well fixed in the ground with the fingers; afterwards a little manure, or pond water, should be given, especially if the season should be hot and dry. "There is a preparatory method," says Abercrombie, "not generally practised, but which will bring them to a much finer, and more vigorous state by August, or September, than they would be in if procured at once from the old beds, at the usual period (viz. the beginning of August) and they will sooner be fully productive. Accordingly, about the end of June, to provide for the intended plantation, have recourse to a bed which bears well, and produces large fruit. Be scrupulous to derive no off-sets from the old worn out stools; and select principally such young plants as are found at the joints of the runners, issuing from the sides of the parent stems.

Take these carefully up with the roots; trim the roots a little, and cut off the runners; then plant them in a nursery bed; a shady border will be a proper place; put in the plants six inches asunder; and give a gentle watering to settle the earth to the roots. There let

them remain in growth till August, September, or October; by which time they will be strong, and in fine order, to be removed to a permanent bed. Those runners that are taken off in August, should be put in nursery beds, as above, but as at this season of the year the weather is generally very hot and dry, they must be carefully shaded and watered, and finally transplanted in October, or at any period between the months of October and March, where they are to remain.

Mr. Keen, a very successful cultivator of strawberries, has detailed his practice, in a very interesting communication, published in the second volume of the Transactions of the Horticultural Society. "In preparing," he says "the soil for strawberries, if it be new and, as is frequently the case, very stiff, it should be trenched; but if the bottom spits of soil, as sometimes happens, be of an inferior quality, I then reccommend only a single digging, placing dung at the bottom of the mould so dug; on the contrary, should the land have been kept in a high state of cultivation, or be good to the full depth, it will be advisable for the bottom spits to be brought up to the top, placing the dung between the two spits. The best way to obtain new plants is, by planting out runners in a nursery, for the express purpose, in the previous season; for it is a very bad plan to supply a new plantation from old plants. With respect to the time of planting, I have always found the month of March better than any other. Sometimes, when the crops have failed, I have had runners planted in the autumn, for the following year, but these have always disappointed my expectations. I plant them in beds, containing three or four rows, and the plants, in each row, at a certain distance from each other, leaving an alley between each bed; the distance of the rows, and of the plants in the rows, as well as the width of the alleys, depending on the kind of strawberry planted. The width of the alleys, as will be afterwards stated, may appear considerable; but I am satisfied that allowing this space for the workmen to stand on, when they water the plants, or gather the fruit, is beneficial, because I have observed, in other persons' grounds, where less space is allowed for this purpose, that great damage is done to the plants and fruit, by the trampling of the people.

After the beds are planted, I always keep them as clear of weeds as possible, and on no account allow any crop to be planted between the rows. Upon the growing of the runners, I have them cut when necessary, this is usually done three times in each season. In the autumn, I always have the rows dug between; for I find that it refreshes the plants materially; and I recommend to those persons to whom it may be convenient to scatter in the spring, very lightly, some loose straw or strong dung, between the rows. It serves to keep the ground moist, enriches the strawberry, and forms a clean bed for the trusses of fruit to lie upon; and thus by a little trouble, and expence, a more abundant crop may be obtained. A short time before the fruit ripens, I always cut off the runners, to strengthen the root; and after the fruit is gathered, I have what fresh runners have been made, taken off with a reaping hook, together with the outside leaves around the main plant, after which rake the beds, then hoe them and rake them again. In autumn, unless the plants appear very strong, I have some dung dug in between the rows, but if they appear very luxuriant, the dung is not required, for in some rich soils it would cause the plants to turn nearly all to leaf. I also have to remark, that the dung used for the manure should not be too far spent; fresh dung, from the stable door, is preferable to spit dung, which many persons are so fond of.

The durations of the beds must be determined by the produce of the plants, which varies much, according to the different sorts; it also varies with the same sort in different soils, so that the precise time of the renewel of the beds must be regulated by the observation of the gardener, in each particular case.

I commence my observations on the different sorts, with

The Pine Strawberry.—The best soil for it is a light loam, though no other kind of strawberry will bear a strong loam better than this, It is likewise to be noticed that this is, of all others, the most difficult strawberry from which to procure a good crop. Particular care must be taken, that they are planted in open ground; for in small gardens they grow very strong, but seldom bear fruit, in consequence of being so much shaded by standard trees. In planting the beds, I keep the rows two feet apart, and put the plants 18 inches from each other in the row, leaving alleys of three feet wide between each bed. The duration of this strawberry with me is three years. The first year it bears the best; the second year, the crop is very good; and the third, it is less.

Keen's Seedling.—May be treated in a similer way, with respect to planting, distance, &c. as the *pine,* but it requires a rather richer and lighter soil, and is not so liable to run to leaf when planted under trees.

The Scarlet Strawberry.—must be treated also like the *pine.* With respect to distance, for planting the beds of scarlets, I put each row 21 inches apart, and each plant 18 inches distant in the row, and make the alleys two feet 6 inches wide.

The Hautbois.—I have always found to thrive best in a light soil; and it must be well supplied with dung, for excess of manure does not drive it into leaf, like the *pine strawberry.* In planting the beds, each row must be two feet apart, and from plant, to plant, in the rows must be 18 inches, leaving the alleys between the beds three feet wide. There are many different sorts of hautbois; one has the male and female organs, in the same blossom, and bears very freely; but that which I most approve, is the one, which contains

the male organs in one blossom, and the female in another; this bears fruit of the finest colour, and of far superior flavor. In selecting this plant, care must be taken that there are not too many of the male plants among them; for, as they bear no fruit, they are apt to make more runners than the female. I consider one male to ten females the proper proportion. The duration of the hautbois with me seldom exceeds three years.

The Wood Strawberry is best raised from seed, which I obtain from fruit just gathered sowing it immediately in a bed of rich earth. When the plants are of a proper size, I transplant them into other beds, where I let them continue till the March following. They are then planted in rather a moist soil, in beds, as the others, each row being two feet apart, and the plants in each row, 18 inches distant, alleys, three feet wide. The duration of this strawberry seldom exceeds two years.

The Alpine Strawberry—must always be raised from seed, which should be sown in a bed of rich earth, in the spring. When the plants are of a proper size, which will be in July or August. I plant them in rows, at the bark of hedges or walls, in a rich or in a very moist soil. The rows two feet apart, and the plants 12 inches asunder in the rows. The Alpines differ from all the other strawberries in quickness of bearing, for no other sort, sown in the spring of the year, will produce fruit under two years; whereas this yields a crop at the end of one year. Its duration with me seldom exceeds two years, and frequently it lasts only one year."

With respect to the raising of wood and Alpine strawberries from seed, as recommended by Mr. Keen, the best French cultivators prefer propagating them by runners, and for many reasons. this plan appears the best.

Mr. Knight, the indefatigable President of the Horticultural Society, has made some very judicious observations, in a recent volume of the Society's Transactions, on Mr. Keen's mode of propagating strawberries, and as almost every one who keeps a garden feels interested in the cultivation of this delicious fruit, we shall give his observations entire. In allusion to the proper season for planting, he observes, "I perfectly coincide with the opinion of Mr. Keen, that the spring is the only proper season for planting. At that season of the year, the ground having been properly worked and manured, will long continue light and permeable to the roots, which will consequently descend deeply into the soil. Abundant foliage will be produced, which will be fully exposed, through the summer to the light; and much true sap will be generated; whilst very little, comparatively speaking, will be expended; for if any fruit stalks appear they should be taken off. In the following season, as Mr. Keen has justly observed, a superior crop will be borne, than by plants of a greater age, or differently cultivated. When plantations of strawberries are made as they are, in the month of August, the plants acquire a sufficient strength before winter, to afford a moderate crop of fruit in the following year; but the plants will not have formed a sufficient reservoir of true sap, to feed even such a crop, without being too much impoverished; their spring foliage will be also exhausted in feeding the fruit, and will continue through the summer, to shade the leaves subsequently produced. The aggregate produce in two seasons, will in consequence, generally be found to be less in quantity, and not very inferior in quality, to that afforded in one season, by a plantation of equal extent, made in the spring.

Mr. Keen suffers his beds to continue three years, though he admits that the produce of the first year is the most abundant, and of the best quality; and in order to afford his plants sufficient space, when they are three years old, he places them at too great distances in my opinion, from each other to obtain the greatest produce from the smallest extent of ground. He places his *hautbois* and *pine* strawberry plants, at 18 inches apart in the rows, with intervals of two feet between the rows; each square yard, consequently contains three plants only. I have placed *Downton* strawberry plants, which require as much space as those of the hautbois or pine, in rows of 16 inches distance from each other, and with only 18 inches distance between the plants; which is nearly nine to each square yard; and I have found each plant at such distances, nearly, if not quite, as productive as when placed at much wider intervals.

The Old Scarlet Strawberry—I have also found to bear admirably when plants have been placed in rows, of one foot distance from each other, with spaces of half that distance between the plants; and I think I have obtained more than twice the produce from the same extent of ground which I should have obtained, if my plants had been placed at the distances recommended by Mr. Keen. Keen's seedling, or Wilmot's superb may be planted in rows, at the distance of two feet apart, and from 12 to 13 inches in the rows.

My beds are totally expended at the end of sixteen or seventeen months, from the time of their being formed, and the ground is then applied to other purposes. I have consequently, the trouble of annually planting; but I find this trouble much less than properly managing old beds, and I am quite certain that I obtain a much larger quantity of fruit, and of a very superior quality, than I ever did obtain, by retaining the same beds in bearing during three successive years, from the same extent of ground."

"I perfectly approve of, and have long practised the mode of management recommended by Mr. Keen, of placing some long dung between the rows, where it has all the good effects which he ascribes to it; but to his practice of digging between the rows, I object most strongly; for by shortening the lateral roots in autumn, the plants not only lo

the sap which such roots abundantly contain; but the organs themselves, which the plants must depend upon for supplies of new food in the spring, must be to a considerable extent destroyed. This mode of treating strawberry plants is much in use among country gardeners, and I have amply tried it myself, but always with injurious effects; *and I do not hesitate to pronounce it decidedly bad*. Taking off the runners is not expedient in the mode of culture I recommend, and under all circumstances, this must be done with judgment and caution, for every runner is in its incipient state of formation, capable of becoming a fruit stalk, and if too great a number of runners be taken off in the summer, others will be emitted by the plants which would under other circumstances, have been transmuted into fruit stalks. The blossoms, consequently, will not be formed till a later period of the season, and the fruit of the following year will thence be defective alike in quality and in quantity; and under the culture recommended, a large part of the runners, when these are taken off in the spring, will be required to form new beds.

The Rev. Thomas Garnier, of Stoke, near Southampton, a successful cultivator of this fruit, destroys all his beds early in August, as soon as the gatherings are over, and then proceeds to form new ones by trenching and manuring them; he selects his plants from the strongest runners of the old rejected plants. If the weather should be particularly hot, and the surface of the ground much parched, he defers the operation of preparing and planting his beds till the ground be moistened with rain. Such is the simple mode of treatment which he has adopted for several successive years, and such is his success that he produces a greater quantity of excellent fruit, on a given piece of ground, than that of any other gardener in the county.

Mr. Williams, of Pitmaston, raises small ridges of earth running north and south, nine inches above the level of the ground, and plants the strawberries on the top, laying flat tiles on each side of the ridge, he finds the produce earlier, more abundant, and better flavoured than on plants grown on the flat ground.

As strawberries require a larger portion of water than almost any other of our cultivated fruits to bring their crops to perfection, this point should be *carefully attended to*. Towards the end of April, when the established fruiting plants begin to advance in bloom, they should be watered frequently, when the blossom is expanded let the water be carefully poured in among the plants, and not over their tops, otherwise a great number of the blossoms would be rendered abortive by the farina being washed off, but when the fruit is set, (which will be discovered by the falling off of the petals) watering over the top is of great service, as it occasions the fruit to swell finer.

Taking the Crop.—The strawberry, according to the kind and situation, ripens in June, July, and August; the main crop is usually over in July. When gathered, this delicious fruit cannot be too soon carried to table, as its fine flavour is soon dissipated. In gathering, about a quarter of an inch of the fruit stalk should be left attached to the berry.

USE.

The fruit, in addition to its grateful flavor and subacid juice, has a cooling quality, peculiarly acceptable in the summer. There are few constitutions with which strawberries, even when taken in large quantities, are found to disagree. Further, they have properties which render them, in most conditions of the animal frame, positively salutary; and physicians concur in placing them in their small catalogue of pleasant remedies.

SWINE.

These are a species of live stock particularly useful, and, when properly managed, may be raised to considerable advantage, particularly by farmers, as they consume that which would otherwise be entirely lost from the dairy, garden, sweeping of the barns, granaries, &c. To millers, distillers, and dairymen, the hog is of considerable importance, as well as all who have an opportunity of growing proper food for their consumption.

Varieties.—These are almost innumerable; but the most material and noted of the British varieties, are the Berks, Hants, Hereford, Shropshire, Norfolk, and Midland County, for large size, as bacon hogs; and the Oxford, Bucks, Suffolk, Essex, and Sussex, as smaller breeds for pork feeding; the Chinese breed is, however, valuable on account of their being good breeders, and particularly kindly.

The following breed, says a correspondent, who has been a great breeder and fattener of large sorts, he has found to answer better than any other, that is a cross from either the Dunstable or Rudgwick sows, with the Wooburn spotted boar, introduced by the late Duke of Bedford. The sows are good mothers, produce a great number of pigs at a time, are very hardy, and come to great weight. The Rudgwick are particularly noted as a very large sort, we have known them to weigh from 80 to 110 stone, 8lbs. to the stone.

Mr. Howis, of Ashdown Forest, in Sussex, is one of the largest breeders and fatteners of this description of stock in the kingdom, and certainly has the finest and best breed of hogs we ever saw, not particularly large, but well disposed to fatten, weighing at 12 months old, from 28 to 35 stone, 8lbs. to the stone. This breed is between the Chinese and Essex, but he gets a cross once in two years by procuring fresh boars, which are not connected by relationship, but as near his own breed as he can. In all cases a cross is absolutely necessary, or the stock will degenerate. Mr. H. has tried the larger sort, but they do not answer so well,

as they cost more to keep, and fatten, and when fat are less saleable.

Breeding.—In selecting both sows and boars, a due regard must be paid to the object for which the progeny are designed. If for making into bacon flitches, the larger breeds are necessary to be sought, in which case the sow should be of a large and deep carcase; head, long, with deep ears, straight chine, and of equal symmetry from the shoulders to the tail, of fine skin, which shows an aptitude to fatten, and the boar of a thicker and closer description than the sow. If the object of breeding hogs is for pork and hams only, it is evident that pork from a hog of 25 to 35 stone (8lbs to the stone) is by far more profitable than those from 35 to 50 stone, in which case, a cross between the Chinese and Essex are found to answer very well, as they come to early maturity. Small bone should always be required in the breeding sorts, as such will produce the best offal. The sow should not be allowed connexion with the boar till eight months old. Mr. Howis says nine or ten months. The boar, however, should not be less than 12 months old, and is in his prime at the age of two years. In other respects, the age of swine is of little concern, since they are generally fatted and killed when young. Mr. Howis, as well as some others, with whom we have consulted, are of opinion that sows at three years old, throw their stock much larger and stronger than when younger, whilst others consider that they are never so good as at the age of from a year and a half to two years and a half old; after which they throw the pigs uneven, although some keep good breeders of favourite sorts till they are four or five years old, but at this age they require more feed to fatten them, and their flesh becomes coarse, and the pork decreases in boiling. The best period for suffering the boar to be with the sow is the latter end of November for store pigs, and May for small porkers, or perhaps, according to the opinion of some breeders, the middle of September and April. After taking the boar, the sow should be confined till her irritability has ceased, the time of parturition may be pretty well judged of by the return of the irritability, which generally happens a few days previous, a circumstance demanding attention. The term of gestation in swine is 16 weeks, producing two farrows in a year, or often five in two years, and from eight to twelve pigs at a time. The pregnant sow should be confined from the herd, in a comfortable roomy stye. Some days before she is expected to farrow, she should be constantly fed by the same person, as she will then become familiar with him, and allow him to move the pigs out of her way, or do whatever else is necessary; otherwise, at the time of her farrowing, she might not let a stranger come near her, for some sows are of a very ferocious disposition on going near them, when they they have pigs, whilst others are so unweildy and careless as to oftentimes lay down upon and smother the greater portion of their young; nor is it at all an unfrequent occurrence to find in the morning, a part, if not the whole of the farrow actually destroyed, from the carelessness or vice of the mother. To obviate this we suggest the following plan, fix poles round the sty, five or six inches from the sides, and at the same distance from the floor of the sty, so that the pigs may get under them, and prevent the sow from laying on them. Not a pig beyond the number of teats should be suffered to remain with the sow. She should be fed sparingly the first three or four days, with mild luke warm food: as over feeding and strong food will frequently produce fever, and cause death; the most nourishing and suitable food for the first month after her farrowing, is pollard or ground oats, mixed with warm milk or water (but great care must be taken not to give food in the least stale) for the first month, as it will scour and stop the growth of the pigs, but after that period the sow can scarcely be kept too well until the pigs are weaned which is generally done at the age of seven weeks. Mr. Howis weans his pigs at six weeks old, when they are turned into a yard (with sheds to lie under) where they are kept till they are shut up to fatten, when they are put into pounds three or four together. The most proper diet for weaning pigs, is the same as that given to the sow while they are running with her.

It has been frequently stated that pigs fed in the usual manner, do not yield the profit which might be expected; in fact, many who have kept an account of their expences, have said that the keep costs them more than they have been able to obtain for the meat after the animal was killed. We have little doubt but what the expences are too great to obtain much profit if the articles of consumption are purchased at the retail prices; yet we are of opinion that the feed usually given does not afford that nourishment to the animal system, which it would do were the agency of heat employed. Thus a handful of barley-meal, mixed with cold water would afford but little nourishment, compared with the same meal boiled; this would afford a rich jelly, such as would be of a fattening quality, and, we have no hesitation in saying that if the food was always boiled, the pigs would be fattened at half the usual expence, and the meat would be quite as good, if not better than under the ordinary way of feeding. We, therefore, strongly recommend the method pursued by Mr. Drury, which perhaps, may, be open to some little variations, but the general principle is good.

To feed young pigs.—Take from 9 to 10 pints of water, set it on the fire in a pan, then mix one pound of oatmeal well in 2 or 3 pints more of cold water, and when the other has boiled put the lithing in, stirring it to prevent it burning to the bottom, and when boiled again for one minute, take it off the fire, and add a little salt to it, and it will be ready for use, (the salt will give them an appetite, and it is allowed to be a cure and a preventive of disorders in all cattle,) they should be kept clean and warm, and if to be had, a turnip or two, should be cut in pieces and boiled in the water for half an hour, previous to the lithing being put in, which will make it sweet, and the oat meal will force their growth and feed them in a

surprising manner; it should be given them when milk warm, one pint to a quart at each meal.

To feed store pigs, or a sow with young pigs.—At the latter end of the year, take half a peck of clean turnips, (if Swedes the better) cut them into pieces, and boil them in 4 gallons of water, for three quarters of an hour, then mix two or three pounds of oatmeal or bean flour well in three quarts more of cold water, then put it in and stir it well to prevent it burning at the bottom, and when boiled again, for two minutes, take it off, add to it a little salt, which will give them an appetite and prevent disorders, the turnips will make it sweet and luscious, and the oatmeal or bean flour will force their growth in a very surprising manner, and increase and enrich the milk of sows, or they may be fed on barley flour, whole beans, bran, or grains, which should be given them sparingly to prevent waste.

At spring and summer, get greens, cabbage, lettuce, turnip and potatoe tops, carrots, pea and bean straw, when green and full of sap, as soon as the corn is plucked off, and all kind of green weeds out of the fields, lanes, and gardens, (void of poisonous qualities such as nettles, thistles, fat-hen, ketlacks, corn-bine, mauls, chick-weed, &c.) and cut them up with a large knife, and boil them in water for one hour, or till the water is nearly taken up with the weeds, when done, according to the quantity of boiled feed; take some oatmeal and bean flour in proportion and mix it well in some cold water, then put it into the boiled feed, stirring it at the same time, to prevent it burning at the bottom, then boil it again for 2 minutes, take it out of the copper or pan, put it into a tub, adding to it some salt, and it will keep a long time providing it be kept by itself, and give it them in a cool state; these feeds, in particular, have been proved by many noblemen, farmers, and the poor class of people, to produce the best of bacon at a little expence, being firm and equal to any for color and good flavour, and if the weeds, turnip-plants, potatoe tops, and twich that is cut up in the hoeing, fallowing, weeding, &c. were brought home and applied in this way, the lower class of people would be able to feed an immense number of pigs in the summer season, at one-third the expence, upon those articles of no value, when prepared with a little corn. The above feeds may be made to any strength, by adding more oatmeal, &c. to the water."

The pig-house or sty in which the pigs are brought up with the sow should be warm, dry, and comfortable, the floor littered with short straw, but not in too large quantities, lest the pigs be smothered beneath it; it should occasionally be removed and kept clean.

Cutting and spaying.—These operations should be performed at six weeeks old, soon after which they may be weaned; the sow, if required to fatten, may be spayed at the same time as the pigs. The boar may be safely casterated at any age.

Ringing.—The pigs should be ringed at the time of weaning, but as this operation is painful and oftentimes ineffectual, as they frequently give way and as frequently require to be replaced, it is the practice of some breeders to cut asunder the two nasal tendons, others pare off the hard skin at the point of the nose with a sharp knife instead of inserting the rings, either of which is found to answer the purpose equally well.

General Management—1st Styes. Roomy, well ventilated, warm, and dry lodgings are objects of importance, and must not be dispensed with, for without these, success cannot reasonably be expected. They should likewise be placed in a situation to receive the morning's sun; and to obviate as much possible, the oftentimes fatal effects of severe cold in winter. A southern aspect, and if possible, a situation behind some lofty buildings should be chosen, so as to protect them from the north winds, for though pigs will wallow in the mire they will be found to thrive best in dry warm and comfortable lodgings; the form of the styes we must leave to the constructiveness of individuals, which of course must be regulated according to the number of swine intended to be kept. To such as breed and rear on an extensive scale, styes placed in a circle are the most convenient, having in the middle a boiling or steaming house, with suitable conveniences for corn, meal, bran, potatoes, &c.

Troughs.—The modern cast iron troughs are considered the most profitable in the end or those made with large bricks or tiles (similar to those used for paving rooms) formed on purpose, about eighteen inches square, placed firmly in mortar or cement, at one end of the pound, and the paving of the pound laid hard against them, they should be well set in a triangular form, leaving the top open about twelve or fourteen inches; but when wooden troughs are used they ought always to be iron bound.

Store Feeding.—The pigs after being taken from the sow should be well attended to, and above all have warm, clean, and comfortable lodgings. Corn and pollard are requisite in pig feeding to every one desirous of having the best of meat. The description of food, however, must depend upon circumstances. Such animals as have been fed upon the offals of the garden, kitchen, dairy, &c. with an addition of a few boiled or steamed potatoes and a little meal, will, if kindly, be moderatly fat.

Mr. Howis's plan of feeding store pigs is twice a day, on bran, pollard, or sharps, mixed with steamed potatoes, the food is always given warm.

It is highly necessary to keep store or stock pigs well and in good condition, which will be a preventive to almost all the diseases they are subject to, independent of their being fattened at about one half of the expence when shut up for that purpose.

Fattening for bacon and pork.—Swine are mostly fatted in pounds but sometimes in the farm yard; the fewer there are together the more speedily will they fatten. The time

which they take to fatten varies according to the size, description, and the condition they are in when shut up, and for what purpose they are intended. Weanlings are generally fatted in a very short period for delicate pork; a pig of five or six months old, will, if in good condition, generally fatten in eight or ten weeks. Small hogs for bacon will be ready for the knife in twelve weeks, and the larger from sixteen to twenty weeks; they should during this important business be kept perfectly dry and comfortable, and fed regularly, giving them sufficient to perfectly satisfy them, at the same time not allowing any of the food to be wasted or left in the feeding hutch or trough, and care taken that they always have clean and fresh water.

The substances used in fattening are various: pea, oat, or barley meal, rank first in point of excellence, pork from this feeding being considered superior to any other description both in point of flavour and weight. Some fatten their hogs on beans, but from this kind of fattening the pork will very much waste in boiling, and the flavor be very indifferent.

With respect to the fatting of swine (observes a correspondent), if done on a large scale, three or four large cisterns under ground are necessary, and sharps, pollard, and bran, well mixed with a sufficient quantity of water, should be kept in them one under another, till they have fermented sufficiently to become sweet, except the top; by this means the food will be much stronger and the swine will fatten much quicker than when given fresh.

The above plan is also recommended by Mr. Young.

Mr. Howis's method of fatting hogs is feeding them twice a day on Indian corn cracked and steamed with potatoes, mixed with bran, pollard, or sharps; he is of opinion that they fat quicker and that their flesh is of better flavor than from any other kind of food, warm food is much to be preferred. The following method has also been forwarded to us by an experienced farmer; it is, he observes, important that styes or pounds should be roomy and convenient, and it is best when circumstances will allow of it not to have more than three or four in a pound together, whose tempers agree;—when fatting keep their styes warm and clean, prepare the food by boiling or steaming potatoes, then mix a small quantity of ground oats, barley, or pollard, peas, buck wheat, or Indian corn; the latter three substances are the best if properly mixed, which should be done by adding to every bushel of pototoes one gallon of peas, buck wheat, or Indian corn. The potatoes and Indian corn should be steamed, made moderately thick, and feed the hogs three times a day, regularly, always giving them the food lukewarm. Another correspondent recommends the following method for fattening swine,—one bushel of peas to one bushel of oats, ground or mixed stiff with milk or water, feeding them regularly three times a day, allowing them plenty of clean cold water for drink.

Diseases of Swine.—This subject has been so much neglected by scientific men, that nothing satisfactory is known in the way of cure, and for the few recipes which we have inserted, we are indepted to those, who have, in cases of disease, used them, if we may give credit to their statements, with considerable success. In the absence, therefore, of scientific results, we feel it desirable to advise prevention, rather than to hazard the numerous adoptions recommended as cures. The diseases which affect these animals generally originate from their being kept in loathsome and uncomfortable situations, inhailing the most infectious exhalations, or being at one time stinted with food, and at another, fed to the extreme; it will be advisable to avoid these as much as possible, by attention to cleanliness, and an equal state of keep.

Fever.—This generally originates from over-feeding, and may be relieved in most cases by giving the animal afflicted with this disease, the following, in milk, once a day till it disappears:—1 oz. of elecampane, ½ oz. of antimony, 2 drachms of nitre.

In cases of a loss of milk, occasioned by fever, the following, divided into four equal parts is considered to be a comfortable cordial, and part of which is to be given three times per day, in their wash.

1 oz. of madder, ½ oz. of elecampane, ½ oz. liquorice, ¼ oz. fennugric powder.

Gargus.—is an inflammatory affection of the udder, or bag, by being distended with coagulated milk, obstructing the lacteral ducts, it is generally occasioned by the milk not being sucked down in proper time. The udder, in such a case, should be anointed with cold ointment, and a small quantity of flour of brimstone and salt should be mixed in the food. Too rich keep frequently produces this disease.

Mange, Scurf, Vermin, or any foulness of the skin.—Take the scrapings of tub butter mixed with about one third of common salt, rubbing it well in with the hand; one or two dressings of the above application will be found in gereral sufficient to remove this disease.

Obstruction of the Bowels.—In an affection of this nature, ½ pint of linseed oil, with ½ oz. sulphur, is often given with success. But when the swine are too much

Relaxed, 2 oz. of oak bark, steeped in ½ of a pint of warm water, giving about a gill full at a time, will be found to answer the purpose required, or a change of dry food, as peas, beans, or barley-meal, will likewise answer this intention.

Staggers.—To effect a cure in a case of staggers, many cut off a piece from the animal's tail, and sometimes slit the ear, the bleeding of which is supposed to contribute to their relief; after which operation, the following drench is given daily until the animal so afflicted is relieved,—Take half an ounce of madder, half an ounce of sulphur, and mix the whole in a little warm ale.

SYCAMORE.

Sycamore (*A'cer Pseúdo-plátanus*), Polygámia Monœ'cia, Linn.; and Acerínеæ, Juss.

The common sycamore is one of our hardiest native trees, and although it attains a size nearly equal to that of the oak, is seldom cultivated in this country as a timber tree. It endures the sea breeze better than most trees, and therefore forms an excellent shelter to plants of humble growth exposed to the withering influence of sea gales.

Culture, &c.

SOIL.

The sycamore will grow in almost any soil, but prefers a light dry earth.

PROPAGATED.

By seeds or keys collected in September, before they become too ripe, and sown in March or April, in light mellow ground; and as the foliage, even of the young plants, is pretty large, they ought not to be sown too thick. Having been one season in the seed bed, they are in a fit state for transplanting into nursery lines, and when nursed there for two seasons, may be planted out for good. When plants of a larger size, however, are required, they should be taken up at the end of the second year, and replanted in lines at greater distances apart. Sycamores succeed when planted of a considerable size and age; but in extensive plantations, plants from four to five years old will always succeed best.

USE.

The timber, which is soft, white, tough and light, is chiefly used by the turner and millwright.

TARE.

Tare (*Vicia Sativa*), Diadélphia Decándria, Linn.; and Luguminóseæ, Juss.

The varieties principally cultivated are the following:—

1. Winter Tare or Vetch.
2. Spring Tare or Vetch.

The latter of these there is no doubt is a variety of the former, but of a much less hardy nature; the winter tare standing the severest frosts without injury.

Estimate of Sorts.—In choosing between the winter and spring tare, every thing must depend upon the intention of the cultivator. If sowings are made for early feed, the winter variety should undoubtedly be preferred; but where the land is foul, requiring two or three times ploughing in spring, or where a late crop is desired, or a crop for seed, then the spring variety ought to be sown.

Culture, &c.

SOIL.

Tares will do well on any rich or good soil, but will grow most luxuriantly on gravelly loams, provided they are not too wet. Tares are often cultivated upon strong clay lands.

PROPAGATED.

By seed, mostly sown broadcast, and well harrowed in, and afterwards rolled, in order to render the ground as smooth as possible for the operation of the scythe.

Choice of seed.—It is hardly possible to distinguish the seed of the two varieties, being so much alike both in size and color. The only reliance therefore must be on the honesty

of the vender; but whatever be the variety, plump seeds and free from seed weeds, will of course be made choice of.

Time of Sowing.—The winter tare is generally sown in September and October, and the first sowing ought to be made as early as the season will admit; and if it be to cut green for feeding, successive sowings may be made to the end of May, but if for seed or hay the early crop is best.

The quantity of seed.—This must greatly depend on the strength and condition of the land, from two to three bushels per acre will be sufficient on any soil; but if for seed a less quantity will be required than if sown for green feed or hay. Many farmers sow rye among their winter tares, as it keeps them from lying on the ground.

Preparation of the land.—The land does not require more than one ploughing for winter tares, and it is not advisable to harrow it too fine, as the clods of earth will protect the plants in winter, and be a great nourishment to them when broken by the roller in the spring. Two ploughings are necessary for spring tares on all soils: first between Michaelmas and Christmas, and the second immediately before sowing; but if the land is foul, care should be taken to well clean it before sown. As this crop is generally sown broadcast there is no opportunity of doing it after the seed is put in, consequently it will require several times stirring, which will be none the worse for the crop. Tares are sown generally after the corn crop.

The After-culture merely consists of pulling out the large weeds if intended for seed or hay, and this should be done as early in the spring as possible, as by pulling up the large coarse weeds it will probably destroy a great number of plants. It is necessary to roll them in the spring as soon as the seeds will admit.

Taking the crop.—Tares are either reaped for soiling, eat off the ground, or made into hay.

If reaped for soiling they should always be cut with the scythe, as by using the sickle the second crop is rendered of little value from the stalks being broken asunder and many of the plants turned up by the roots. *In reaping tares for seed* they may be taken either by scythe or sickle, and dryed, thrashed, and stacked in the manner of pease.

In making tare crops into hay more attention is required than perhaps for any other of the artificial grasses, as wet is more injurious to them, and requiring more sun and air. The time for cutting may be known by the blossoms beginning to fall and lie flat.

The Produce when cut green is from ten to twelve tons per acre, made into hay about three tons per acre. The produce in seed varies from three to six sacks; but in some instances, under good culture, it has been forty bushels and even more.

USE.

1. *As green food* tares greatly exceed any other vegetable, and are extensively used for soiling horses, neat cattle, and hogs.

2. *The folding off tares by sheep* is sometimes practised, but it is not the way to consume them to the greatest advantage, as the sheep in their eagerness to get at the fresh seed run over them, trample down a great many, and consequently a greater portion of the crop is spoiled.

3. *Hay.*—Tares made into hay is also very acceptable, but the produce being so much smaller than in the green state it is seldom made.

4. *The seed* is generally taken for reproduction, and is frequently given to pigeons and poultry, and in some instances to horses, cows, sheep, and swine.

TARRAGON.

Tarragon (*Artemísia Dracúnculus*) Syngenesia Polygámia Supérflua, Linn.; and Compósitæ, Juss.

Tarragon is an aromatic perennial plant with a branchy stem and tortuous roots.

Culture, &c.

SOIL.

The soil must be dry or the roots will perish in the winter.

PROPAGATED.

By sections of the root or offset bottom slips in the spring or autumn, or by slips, or cuttings of the young stalks, or branch shoots in July and August. They should be planted in beds or borders, from six to ten inches apart and well watered, when they will readily strike root, and be fit for use the same year. When it begins to run and seed is not wanted, it must be cut down and fresh shoots will be emitted.

USE.

1. The young leaves and tender shoots are used in pickles, and with minced shallots are eaten with beef stakes.

2. An infusion of the leaves in vinegar makes an excellent fish sauce.

THORN.

The White Thorn or Haw-Thorn (*Cratæ'gus Oxyacántha*) Icosándria Pentagy'nia, Linn.; and Rosáceæ, Juss.

The Haw-Thorn is justly considered one of the best hedge-plants in Europe, for which purpose it is principally cultivated.

Culture, &c.

SOIL.

The haw-thorn will grow in almost any soil, but is chiefly employed for the making of hedges; the rapidity of its growth will mainly depend upon the nature of the soil in which it is planted. It will therefore be best in all instances to employ if possible a soil of good staple, especially if a good hedge is an object of importance to the planter.

PROPAGATED.

1. *By seed* which ripens in October, and may be in most seasons collected from old hedges in any quantity. As the seeds are collected, they should be allowed to remain in sacks, not too many of them put together, as they are extremely apt to ferment, and if such a circumstance occurs, many of them will be spoiled. As they are collected they should be carried to the nursery, and spread out in a convenient spot, (which from the process the seeds undergo, is termed the rot ground) not more than ten or twelve inches thick and mixed with any light dry sandy soil while in this situation, great care must be taken that they do not ferment too much, for fear of injuring their vegetative properties; if at any time fermentation becomes too great, they then should be turned over once or twice, which will sufficiently counteract that tendancy, as well as hasten the decay of the pulpy matter with which the seeds are covered. In this situation they should remain for one year at least, although some nurserymen have them for two. The intention of thus placing them in such a situation is, that the hawthorn, ash, mountain ash, and some other seeds, do not vegetate the first season after being gathered; and where they are sown at that period, would be one year at least in the ground without vegetating. During that time they would be liable to be destroyed by vermin, the ground would be occupied to no real advantage, and an unnecessary expense would be incurred in weeding and cleaning the ground.

2. *Time of sowing.*—As some of the seeds commence vegetating about eighteen months after they are gathered, it is judged the best practice to sow them into beds at that time, that is the February or March following.

3. *Making the seed beds.*—The ground for making the seed beds should be light, and if not moderately rich, should be made so by the application of good rotten manure, the ground should be deeply and finely dug; and as the beds for this seed are to be formed by having a portion of the surface pushed off with the back of a rake, or what is called cuffing among nurserymen, it is necessary for the better executing of that process, that the ground be deeply and finely raked, as the process of digging goes on. When the ground is thus prepared, the beds are marked off at the required breadth, which is generally three to four feet, and the process of cuffing them is then proceeded in, in the following manner:—

After the ground is dug, and raked fine as above, measure the proposed width, stretch the garden line, and run it off along the side, by the tread of your feet; return with one foot in the tread of the other, and so as to form an alley of three times the breadth of your foot. Having shaped the bed by these means, and being provided with a wooden headed or cuffing rake, stand on the alley on the opposite side of the bed; turn the rake on its back, and push off the earth from one half of the bed to the proposed depths, as far as the side of the alley marked with your feet, being careful to keep the earth so pushed off quite straight. When one side is finished, turn round, and do this other in the same manner. Having completed the cuffing of the bed, carry the rotted haws in a closer wrought basket in one hand, and with the other lift them out, and with a sudden dash cast them along the half of the bed next to you; turn round, and do the other in the same manner. If your seed be good, they should lie within one fourth of an inch of one another. Having completed the operation of sowing, if the state of the seeds will allow, draw a roller of about sixty pounds weight, and exactly the breadth of the bed along it, which will press in the seeds, so that they will maintain their place during the operation of

drawing on the earth again, which is presently to be done. If, however, the seeds be too moist to allow the roller to pass over them without sticking to it, beat them with the back of the spade. The operation of fixing them in the soil being performed by one or other of these means, take the rake, stand on the alley on the opposite side of the bed, put in the teeth of the rake immediately beyond the cuffing or ridge of earth pushed off, and by a sudden pull draw it on the bed, so as to cover its lower half equally; and having finished this half, turn round, and finish the other in like manner, and the operation is completed."

Sometimes haws are sown in drills, which upon the whole, is a much better way, as affording a freer circulation of air to pass through the plants; and as the largest and best plants are always to be found on the outside of the beds, sowing in drills instead of beds presents a greater number of outsides, and consequently a greater number of strong plants. When this mode of sowing is adopted, it should be carried on as the ground is dug; thus having dug the breadth of eighteen inches or two feet, stretch the line parallel to the trench, with a broad hoe or spade, form a drill about nine or ten inches broad, into which sow the seeds, and cover with the mould taken either out of the drills already sown, or from the next following. While performing this operation, the operator should stand in the trench which will not tread the dug ground; having sown one drill, proceed to dig another breadth, and so on until the whole is finished.

PLANT.

When the seeds of hawthorns have been one year sown, it will be necessary to draw the strongest plants from the seed bed, to be transplanted out into nursery beds or lines; in taking up these plants, the greatest care ought to be taken both to preserve the roots of the plants removed from injury, as well as the seeds which may not yet have vegetated, and the small plants left to gain strength for another season. To facilitate the pulling up of the young plants, the bed should be loosened with a fork in a careful manner, and when the plants are removed, the beds should be regulated so as to leave them that the drought may not penetrate to the tender roots of the plants which are left. Those taken up should as soon as possible, be either planted into beds, at about four inches apart, plant from plant, where they are to remain, if in beds as above, for one season only; but if in lines at the above distance, they may remain for two years, by which time the most forward of the plants will be fit for planting out for hedges, and the less forward should be planted again in the nursery, to gain strength for another season or two.—*Mc. Intosh Practical Gardener.*

USE.

For making hedges, see hedges.

THYME.

Thyme (*Thy'mus Vulgáris*) Didynámia Gymnospérmia, Linn.; and Labiátæ, Juss.

Thyme is a sweet-scented aromatic evergreen under shrub, there are two species cultivated:—

1. *The Common Thyme,* of which there are three varieties, the broad, the narrow-leaved, and the variegated.
2. *Lemon Thyme,* (Thymus Citriodorus), this is readily distinguished from the other varieties from its strong smell of lemons.

Culture, &c.

SOIL.

A light rich earth, a dry and rather sheltered situation, seems best adapted for the growth of this plant.

PROPAGATED.

1. *By seeds* sown in March or April, either broadcast, or in drills six inches apart, and slightly raked in. They should be well watered in dry weather, both before and after they come up, and as soon as plants are three or four inches in height, they must be thinned out to six inches apart, giving occasional light waterings, in dry, warm weather. Those taken out may be planted along the edges of borders, three inches apart, where they will at once form a neat close hedging. Those who raise considerable supplies of thyme for the markets, usually sow large portions, thickly in beds, to remain till of useful growth, for the purpose of being drawn off root and top together, at different seasons of the year.

2. *By offsets* on sections of the stool made in the spring or early in the autumn, planted in light earth, and watered, and shaded, until they have taken root. To make branches root quickly, loosen the mould, about any established bushy plants in spring or summer, and lay some fresh earth a small depth upon the spreading shoots, they will all be well rooted

for planting off the same year. The best time for removing established plants is March, April or May, August or September.

To save seed. The seeds ripen abundantly in summer and autumn, the seed spikes should be spread on a cloth, as soon as gathered, to dry, when they should be rubbed out clean and laid by for sowing the following year.

USE.

The leaves and young shoots of both species are used in stuffings, soups, and sauces.

TURNIP.

Turnip (*Brássica Rápa*), Tetradynámia Siliqúosa, Linn.; and Crucíferæ, Juss.

The turnip is a hardy biennial plant, a native of this country, but in its wild state can scarcely be distinguished by ordinary observers from wild mustard.

The turnip, like the carrot and the bean, is cultivated both in the *field* and in the *garden;* the former in accordance with our usual arrangement, will demand our first attention:—

ON THE CULTURE OF FIELD TURNIPS.

By H. E. BLYTH, Esq., Deepdale, Norfolk.

The following observations relate to the management of the turnip crop on a soil of a light nature but not sandy, on a farm in West Norfolk. The system, though general, is frequently varied in the same neighbourhood by persons farming land of the same quality. The plans here specified are those practised on the farm above mentioned. On soils of better quality the system of management is much different.

Culture, &c.

SOIL.

The turnip prefers a rich soil with a dry loam of a rather loose texture.

PROPAGATED.

By seed, sown either broadcast or in drills. In Norfolk the prevailing method of sowing is by drilling, either on ridges at twenty-four or twenty-seven inches distance, or on the surface at the distance of sixteen to twenty-one inches. The merits of the respective plans are so nearly balanced that it may be difficult to say that either is preferable to the other; ridges are best suited where only farm yard manure is employed, the flat work where artificial manure, such as oil-cake or bone dust, are used. The ridges will grow larger turnips and best suit where some are wanted to be drawn; the flat work will grow more in number and is better adapted for being fed off by sheep. Both plans are used on this farm.

The varieties of turnip now grown in this country are very numerous. Of swedes, those that grow with a clean root and neck, and plenty of top, are found to stand the sharp weather better than finer qualities with small top; while the coarse stringy kinds exhaust the land too much Of white turnips, the white loaf and stone are the best for the main crop. The decanter or pudding will grow great weight for early feeding but soon lose their quality; and the Scotch variety growing nearly under ground and very thick in plant, will produce most sound food in March and April.

Choice of seed.—Every farmer ought if possible to grow his own seed, or know where it is grown, particularly swedes; the losses in this crop from bad seed have frequently been very serious. The quantity of seed sown is about four pints of swedes and three of other turnips which are smaller and of quicker growth. New seed is to be preferred, but if well kept it may be safely used three or four years old, making a trifling allowance by adding to the quantity; it is also proper to steep it before sowing, the light or bad seeds will swim off, and the whole come up quicker and more level.

Time of Sowing.—Swedish turnips are sown from the 25th of May to the 20th of June; white turnips from the 10th of June to the 1st or 6th of July; Scotch or other turnips, for the last feeding of ewes and lambs in the spring, to the 14th; in some seasons much later; the kinder the land is for turnips the later the seed will bear to be sown, and ought to be sown.

Preparation of the Land.—The turnip crop in the prevailing system of four course husbandry follows wheat, and it is the same when it comes only once in five or six years, or as it is called, in the five or six course shift. The wheat stubbles are ploughed as soon as the wheat sowing is over, and (supposing the land to be clean) as deep as the staple soil will admit; if the work be kept properly forward during the winter they are cross-ploughed, beginning with those that are first wanted for sowing in February; or as soon as they can be done; another clear or full earth is given as the season advances, and with the requi-

site harrowing to have the land work well, it is brought into proper order to begin sowing by the latter end of May for early turnips, and for later crops in the following month.

The proper period for applying the manure must of course depend upon the system of cultivation pursued; whether the ridge system or flat work be adopted. The former will be first noticed :—

1. *The application of manures and the manner of sowing of the seed by the ridge or drill system.*—The manure is carted out of the yards in the winter season into heaps, bottoms for which have been previously prepared either of clay, marl, or good mould from borders; the load is driven unto this bottom and shot up, covering it first with a thin layer, and so continually carted on till a sufficient quantity is brought out, and putting the layers of muck if they come out of different yards evenly over each other, that they may all mix together when turned—the driving on presses the heap, and prevents too great fermentation; in fact, it will not heat till stirred. About a fortnight or three weeks before sowing, the heap is turned over, the mould of the bottom thrown upon the top, to prevent as much as possible the escape by evaporation of any useful parts; and it will be in a proper state for use in a short time. When the time arrives and the land not too wet, a double-breasted plough with a pair of horses opens a deep furrow, (the share ought to cut a little more than the half of the ridges, if it be twenty-seven inches say fifteen for the share), and returning at the distance of twenty-seven inches forms ridges with furrows between them ready for the reception of the manure; this is brought on the cart or tumbril, the wheels of which spread exactly the width of these drills if properly made, while the horses walk down the centre one, and the manure is pulled off and spread evenly in the furrows, the load is made to extend from one end of the field to the other, taking three, four, or five drills at a time, according to the length, in order that there may be no carting across the ridges; and the manure is put on at the rate of ten or twelve three horse cart loads to the acre. A second double-breasted plough follows down the centre of each ridge, splitting and covering the manure, forming another ridge over it; a light roll (if there is not one attached to the machine) is now passed over two or four dills at a time; and then follows the machine, making two drills and depositing the seed directly above the manure, a chain or brush covers it, and the work if properly done is then completed neatly.

After-Culture.—As soon as the seedling turnips are visible enough to guide a hoe, the the horse-hoe is set at work, cutting the bottom of the furrow and sides of the ridges, leaving only sufficient mould to keep the plants in the drill growing; when these are strong enough to stand the hand hoeing, they are set out at the distance of twelve to eighteen inches, and singled by children or women; in another fortnight they are again hoed to cut the remaining weeds; the horse hoe follows and finishes the work, and there ought not then to be a weed left. The horse hoe generally used takes one drill at a time, is drawn by one horse, driven by the man who holds it, and will do four acres in a day. The hand hoeing and singling out costs from five to six shillings per acre.

2. *The application of the manure and the manner of sowing the seed on the flat surface.*—In sowing after the plough by drilling on the flat work, the manure is spread and ploughed in immediately, the ground lightly rolled, and the machine taking three or four drills at eighteen inches follows, putting the seed in as fleet as possible, and a light harrow covers it;—the distance between the drills is sometimes varied from fifteen to twenty-one inches. If oil cake be used, as is very frequently done, it is ground fine, and drilled at the same time with the seed the machine putting the cake in below it; care being taken that the *mould falls on the cake* before the seed comes down, which it does in a separate tunnel at a little distance behind the other. Oil cake is generally sown at the rate of a quarter or half a ton per acre; a drill with two horses led by two boys, and worked by a man, will do from ten to twelve acres a day. One third of a ton of oil cake will grow as good turnips as nine or ten tons of manure, but the succeeding crop of corn is best after the manure.

After-Culture.—When the plants in these drills can be seen, the inverted horse-hoe for flat work is put in, cutting nearly all the ground; it is drawn by one horse, led by a boy and worked by a man, taking three drills at a time, and will do from twelve to fifteen acres in a day; the ground ought to be dry. The hand-hoes are put in as soon as the plants are strong enough, and again at the end of a fortnight they are seconded; these plants are set from fifteen to twenty-four inches, unless for a spring feed, when they are set much closer; another horse-hoeing completes the work. The hand-hoing costs five shillings to seven shillings per acre.

Drilling machines.—There are a great variety of drills for performing both the ridge and flat work; the former is frequently performed by a hand barrow machine, one of which is used on this farm; a man works it and does four to six acres a day. Many are made to go with a horse or mule; the latter must be worked by one horse, and where cake is drilled, by two.

Insects.—The Fly is the most destructive enemy with which the turnip has to contend. To guard against it, many expensive plans have been recommended, few, if any, with success; the only one likely to succeed and which is now generally adopted here, is to provide well against its visits by sowing plenty of seed; they *will* eat, and they *must* be fed; many farmers do not hesitate to sow six or eight pints of seed on the ridge, this effectually gluts the fly and secures plenty of plants, for thick sowing forces the growth; the loss of the

crop is certainly much less frequent than formerly, and it is to be attributed chiefly to this system. The extra expence of two shillings may thus save an acre of turnips.

USE.

1. *Feeding Off.*—Turnips are frequently wished for forward sheep by the middle of October, and by this time the white turnips, such as the decanter or white loaf, sown the first or second week in June, have got their full growth and quality. A few (and the fewer the better) of the largest are drawn out, chiefly up and down the furrows where the hurdles have to be set, and are taken either into a yard for bullocks, or thrown on some piece of grass land for them to eat. Sheep are folded in lots of eight or ten score (there ought not to be more) having a fresh piece *always* given to them *the first thing every morning;* when the crown of the turnip is eaten level with the ground, the root is pulled up and not before; as much room should be allowed the sheep as can well be afforded, the more room the cleaner they will eat up the bottoms. Swedes are not fed by sheep till after the frost has softened them a little, or they would most likely injure their mouth. Swedish turnips sown early and intended for feeding bullocks with in a yard, are began the first week in December, later sown continue growing till a sharp frost stops them. They are frequently drawn off to the extent of half the crop or more, but it should always be remembered that the abundance of the following crop of corn mainly depends on the quantity of manure produced by feeding on the ground. The tails are at all times cut off and left on the land, and the tops are found very useful for all kinds of store stock.

2. *Storing.*—Swedish turnips are stored on this farm during the month of December, the the tops and bottoms being cut off they are taken to some dry shed, or laid in a heap and covered with straw, frost does not hurt them much, but if kept from it they retain their quality better, and will remain sound and good till May day, or longer; with such supplies as these will afford, there will be no difficulty in meeting the demands of the severest winter for all kinds of stock.

The land after the turnips are fed off is ploughed clean in dry weather; sometimes only one ploughing, with the use of a good scarifier, is found quite sufficient to prepare it for barley, and if the land be worked only in fine weather more is useless.

Deepdale, Sept. 2nd, 1830.

Culture, &c. of Garden Turnips.

1. Early White Dutch
2. Early Stone
3. Common Round White
4. Large Round White
5. Yellow Dutch
6. Aberdeen Yellow
7. Sweedish Yellow Stone
8. Maltese Golden
9. Green-topped Large Round White
10. Red-topped Large White
11. Tankard
12. French
13. Small Round French
14. Black Russian

Of these the two first are the best adapted for early crops. For winter use the common round white, the yellow Dutch, and Aberdeen yellow, will afford an ample supply. The swedish turnip when transplanted affords an abundance of greens which are very acceptable in the spring.

SOIL.

The soil should be moderately rich, light, sandy, and finely broken. and it should never be manured with recent rank dung. The situation should be free and open, for which reason turnips grown in the field are always much better and of finer flavor than when grown in the garden.

PROPAGATED.

1. *By seeds,* sown either broad-cast or in drills; if broadcast, for a bed four feet and a half wide and twenty-four feet in length, half an ounce of seed will be required; if drilled, a less quantity will be sufficient.

2. *Times of sowing.*—For early crops and successional supply, make small sowings every month from the end of March to the last week in June. For the main or winter crop sow in July, and again a smaller crop about the middle of August.

3. *In preparing the ground for the reception of the seed,* it should be well broken by regular digging, and the surface neatly levelled; then being provided with some good bright seed, the ground must be regularly sown all over, and immediately raked in, and in summer, if showery weather happen, it will soon be up, when it must be watched to see if the fly attack it, and if it does it is recommended to water the bed, sprinkling powdered quicklime over the plants immediately afterwards, or otherwise performing the operation in the morning before the dew is off. The author of the Gardener's Manual suggest the employment of *sulphuret of lime,* prepared by carefully mixing four parts of perfectly burnt *quick-lime,* and one part of flour of sulphur, and then adding as much water as will just slack the lime and bring it to powder. When quite dry, mix the ingredients thoroughly in a mortar, and sprinkle the rows of young plants just as they emerge from the earth; if a small portion of soot were added the mixture might be still improved.

After-Culture.—As soon as the plants have got into rough leaf, hoe and thin them to six or eight inches apart, cutting up all weeds. When the plants have attained a moderate

size, a part may be drawn as wanted, thinning them so as to leave those intended to reach full maturity, at least twelve inches apart every way.

Taking the crop.—On the approach of frost take up the main crops, cut off the tops, and house the roots under a shed in a heap, covering them first with dry straw, and then with sand ; thus protected they will keep sound and good till March.

Saving the seed.—On a small scale it is better to purchase than to grow the seed, for the seed-farmers have convenience for preserving the plant free from admixture of sorts, which the domestic gardener does not possess ;—if, however, a few roots be left in the ground, or transplanted between November and February, apart from all other plants of the same tribe, good seed may be obtained. Set the roots so deep as to be covered with soil ; the flower-stalks will be produced in spring, and will ripen their seeds in August ; tie them to stakes to guard against the force of winds.

USE.

1. The root is extensively used in broths, soups, stews, &c. or otherwise boiled, and mashed, it constitutes a favourite vegetable dish.

2. The young leaves or tops are gathered in the spring and dressed in the same manner as greens, spinage, &c. and are in this state preferred by many to even cabbage itself.

VEGETABLE MARROW.

Vegetable Marrow (*Cucúrbita Ovífera, var* :), Monœ'cia Monadélphia, Linn. ; and Cucurbitáceæ, Juss.

The vegetable marrow or succada gourd is a variety of the C. Ovifera, the fruit is uniformly of a pale yellow color, and of an elliptic oblong shape ; when full grown it is about nine inches in length and four inches in diameter, and is by far the best adapted for culinary purposes of any species of the gourd family.

Culture, &c.

The vegetable marrow, and indeed all the species of the genus cucurbita, as the squash, pompions, and gourds, are *propagated by seeds,* which may be sown either in April on a hot bed and transferred to the open garden towards the latter end of May, in a warm situation and in a rich soil ; or they may be sown where they are to remain, in the open ground, in the month of May, in a trench filled with recent dung. As the runners extend they should be pegged down at a joint, they will speedily take root, which will strengthen the plants materially ; they should be frequently watered, especially if the weather is hot and the ground dry.

USE.

1. The vegetable marrow, according to Mr. Sabine, is useful for culinary purposes in every stage of its growth ; when very young, it is good if fried with butter ; when large or about half grown, it is excellent either plain, boiled, or stewed with rich sauce ;—for either of these purposes it should be cut in slices. The flesh has a peculiar tenderness and softness, from which circumstance it has received its name.

2. The tender tops when boiled form an excellent substitute for greens.

VERMIN.

Such animals, birds and insects as impede the labors of the husbandman, or otherwise injure the produce of his fields, gardens, and plantations, are considered as vermin.

Let the agriculturalist but reflect upon the many and continued depredations which are committed by vermin not only upon his land before it is sown, upon his crops during their growth, but after they have been harvested and even stacked, and the consequent loss he must sustain by suffering them to increase, and he must at once perceive the necessity of adopting some means of destroying or keeping them under.

By suffering vermin to prevail to a great extent, especially the larger kinds, as weasels, stoats and pole cats, the farmer is not

only deprived of his, perhaps, favorite sports, but in a great measure, of the luxuries of the table, and is in fact keeping game only to fatten the vermin, which infest him, and which, if unmolested, will eventually predominate and cause an utter annihilation of what ought to be otherwise a source of profit. The destructive ravages of vermin of the insect tribe in gardens and plantations, can only be appreciated by those who are the victims of their depredations. Some of these are so pernicious and disagreeable, that it becomes a matter of some importance to the farmer to rid himself. of them even at any expense.

In treating of the destruction of vermin, we shall adopt the following arrangement.

1. Vermin of the animal kind.
2. Of the bird kind.
3. Of the insect kind.

Vermin of the Animal kind.

1. The Rat (*Mus rattus*) and the Mouse (*Mus musculus,*) are among the most destructive to the agriculturist.

Various are the methods used for the extermination of these animals, but one of the best and readiest means is perhaps by sponge, cut into small pieces and fried and dipped in honey. These are placed together with shallow pans of water in the neighbourhood of their holes. On their eating the sponge and then satisfying the thirst which it must necessarily produce, their stomachs become so distended, that it generally proves a fatal repast.

The works of Hurlet were lately over-run with rats to such a degree, that it became absolutely necessary to adopt summary measures for totally extirpating the destructive vermin. The following means were resorted to, and they were attended with the most perfect success. A number of corks cut down as thin as sixpences, were roasted or stewed in grease, and then placed in the way of the rats. The dish was greedily devoured as a special delicacy, and as was anticipated they all died of indigestion.

Poisons are sometimes had recourse to, for the destruction of these animals, as henbane hellebore, nux vomica, but more frequently that of arsenic; the many fatal accidents however, which are almost daily occuring by its use, ought to lead us to the adoption of traps and other stratagems, in preference to employing a substance, a few grains of which taken into the stomach, is sufficient to deprive a person of existence. Scarcely indeed does a week pass without, an inquest being held upon the body of some unfortunate being, who, by the negligence of individuals employing this poison, have met with an untimely death. Independant of the danger attending the use of poison for the destruction of vermin, it is quite inadmissable in many situations, especially in inhabited dwellings, as the intolerable stench caused by their decomposition beneath the floors, wainscots, &c. are oftentimes scarcely to be endured.

A very excellent stratagem is to feed them regularly for two or three weeks in an apartment that is not in use, leaving only a small hole for the entrance of the vermin with a sliding door on the outside, after being thus fed and thinking themselves perfectly secure in the enjoyment of their ample fare, they will collect in great numbers, when watching an opportunity the slide should be closed, and having thus secured them, may be destroyed by dogs.

The following singular, though ingenious method of catching rats, has been adopted by some with great effect. Having procured a cask of moderate height and dimensions, it should be put in the place most infested with the vermin, at first the cask is only to be employed to allure them to visit its solid top, by means of boards or planks placed in such a manner as to enable them to ascend with ease and safety to the grateful food placed upon it. After being thus lulled into security, a skin of parchment should be stretched over the cask in place of the boards, which must be cut for several inches with transverse incisions through the centre, so as to yield on the slightest pressure. Water to the depth of five or six inches is to be poured into the cask, and in the middle of this, a brick should be placed on its narrow end so as to project a few inches above the fluid, and that one rat may find on the top, a place of security.

This being done, the parchment should be baited as usual; no sooner does one plunge, through the parchment, than it ascends the brick and commences its lamentations, nor are its wining notes uttered in vain, for others soon follow and share the same fate, and now a dreadful war breaks out among them to decide the possession of the dry seat upon the brick. Battles follow in rapid succession, attended with such loud shrieks of distress, that all the rats in the neighbourhood hasten to the spot and experience a similar fate. By this means, hundreds may be caught, which might be greatly facilitated by putting a living rat into the tub, or one procured from a rat catcher.

The common or hutch trap may be used with effect, provided it be well baited, where but a few vermin prevail, but where there are great numbers, it is best to have recourse to some of the above expedients.

The instinct of the rat is quite surprising and almost persuades one that nature has given it in addition to its wonderful fecundity a degree of cunning approaching, almost to the faculty of reason. Persons have however been known to have had such dominion over them, insomuch as to make them entirely subservient to their wills; this may appear almost an impossibility; all the art and mystery of the rat catching profession, has, however been made known to the public by the disclosure of a Mr. Broad, a farmer, at Thruxton. By some means this person has discovered that a mixture of pale malt, with a very small portion of oil of carraway formed so inviting a repast to the rats, that they could not resist it. The sagacity of the animal is so strong and its sense of smelling so acute that the least taint of the interference of man will prevent it from indulging its natural propensities. It is upon this, that the above person grounds his plan, which is, that the operator whenever he touches the trap, in order to bait them, must overcome the natural odour of his body by smearing his hands with the bait that he employs, and must never on any account omit the precaution when he comes in contact with the traps he is using.

In order to prevent vermin from ascending and taking up their abode in stacks, they should be placed upon pillars of stone, which should be incased in tin. Corn bins likewise lined with tin, and having small wire work lids not only affords a barrier against the inroads of vermin, but by a free circulation of air, keeps the corn from becoming musty.

When rats or mice have lodged behind wainscots, &c. the best means of driving them out, is by fumigation; for this purpose, put some common salt into a table spoon, pipkin, or any other vessel, and pour upon it a small portion of oil of vitriol, (*Sulphuric Acid*) by introducing this mixture into a hole in the wainscot, so much suffocating gas is produced as to cause their almost immediate expulsion.

One of the most effectual means of entrapping garden mice, is by an inverted flower pot of a large size, buried in the soil with its bottom on a level with the surface. If this be baited with corn, the mice will enter by the small hole, and after feasting to their hearts content, will be unable again to procure their liberty.

The Weasel, (*Felis Vulgaris.*)

Although the weasel is beneficial in some respects destroying rats, mice and other noxous vermin, it is nevertheless a formidable foe to poultry, game and rabbits. It may be readily caught by hutch or box traps, baited with a small bird or egg, and may be destroyed by sal ammoniac mixed and beat up with the white of an egg, wheat, flour and honey; and laid in small pieces in places where they frequent.

The Stoat may be caught or destroyed in a similar manner.

The Polecat, (*Felis putorious.*)

These animals are remarkable for their disagreeable smell. They feed on flesh, frequently stealing hens and other poultry. In winter they visit the dairy, making free with the milk and cream. They may be caught by the hutch or box traps, baited in a similar way as for weasels. If the traps are placed in or near hen houses, care should be taken to remove them before the fowls begin to move, setting them again on their going to roost.

The Mole, (*Talpa europæa*)

Moles are by some agriculturists considered as extremely mischievous and by throwing up the mould upon the surface, prove of the greatest injury to the land, and in some cases where they are very numerous, render it utterly useless. Others however of the first rate experience have argued warmly in defence of the moles, which have according to their views, been so unjustly condemned to the trap. Among these we have the Ettrick Shepherd, Mr. Hogg who goes so far as to call his friends, the moles, "the blessed and innocent little pioneers." The foundation of Mr. Hogg's argument is, that they annually give the first top dressing to our pasture lands, and that too more regularly and more effectually than man.

In some parts of Scotland, Mr. H. informs us that many of the smaller proprietors of land have actually prayed their Laird to discontinue the employment of the mole catchers and to spare the remnant of their old friends and suffer them to breed again; for their stock since their destruction has been reduced at least one sixth, and in some instances one fifth, and not only that, but has introduced two exterminating diseases, the pining and the foot rot, neither of which was known in that district till the extermination of the moles. In the garden however, we must at once give these "innocent pioneers" up to the vengeance of the trap, as in such places their work of destruction is very great and oftentimes irreparable. The secret by means of which they succeed in driving them from the earth, is to place slices of leek, garlic, or onion in a green state within their holes; their antipathy to these vegetables is so great, that they will immediately leave them and expose themselves to be taken. They are more generally however, taken by traps, which are too well known to need description.

THE HEDGE HOG.—*Erinaceus Europæus.*

This little animal, the object of persecution, not only to school boys, but to the farmer and game keeper, on account of its supposed mischievous propensities, is in fact, one which the agriculturist should endeavour to preserve; as it is the most effectual destroyer of snails, worms and insects, on which it almost entirely subsists. A garden in which a hedge hog is kept, will, in the course of two or three nights be entirely freed from slugs, and that enemy to fruit the millipede is a favorite food to him. The London gardeners are so aware of this as often to purchase hedge hogs to put into their grounds. The opinion that this animal sucks the cows, is too absurd to require refutation. The mouth of the hedge hog is too small to lay hold of the teat of a cow, even if it could be believed by any reflecting person, that she would suffer its sharp bristles to touch her, and if indeed it ever has been found eating poultry or game, as asserted by some, they must have been previously killed by rats, weasels, or some other more ferocious animal than the hedge hog, whose habits on the contrary, are those of gentleness and timidity, who is not formed for attack, and whose sole mode of defence is rolling itself up in a ball and exposing its strong prickles to the enemy.

Let then the farmers and others prove this statement of facts by observation, and we doubt not, but that those who attentively observe its habits, will see the necessity of rescuing a harmless and useful creature from the abhorrence in which it is held, and the general persecution it meets with.

2. *Vermin of the Bird kind.*

Among the most injurious of this kind is the

KITE, (*Falco Milvus.*)

As almost every bird of the air is able to elude its pursuits, it subsists generally upon accidental carnage, and may be considered an insiduous thief attacking young poultry, pheasants, partridges, &c. To ensnare kites, iron gins, should be fixed about four inches broad near the places where the poultry are kept, baited with chicken, mice, or raw meat. When one of these birds has been caught it should be put upon a stake with its wings extended, and it will be the means of keeping others from the place. They are however by no means frequent.

All the granivorous birds are particularly injurious to the farmer at seed time, and may be deterred by shooting, or by scare-crows, as figures of men, cats, feathers, &c. but generally by shooting and hanging up the victims as a warning to others of the same kind. Bird being very destructive to the seed of all the Brassica tribe, it will be necessary to guard against them by covering the beds with mats, or with old fishing nets if they can be procured until the seeds begin to vegetate. A very good and simple scare for birds is made by taking a long straight slender rod of hazel or any other elastic wood about six or eight feet long, placing it in the ground in a slanting direction, and from the farthest point, dropping a line of small cord, to which is to be fixed a potatoe stuck full of feathers of different colors. This will produce a simple pendulum which is kept in motion by the wind. The potatoe may be suspended at about twelve or fifteen inches from the ground. An excellent plan to prevent birds from nipping off the tops of young plants immediately on their appearing above ground, is to fix pegs in the earth, about five inches high, and at the distance of four feet from each other. To these, worsted threads should be attached from peg to peg crossing them at intervals, something like what children call, "scratch cradles." this effectually scares the birds. Seeds may be protected in the same way. It must, however be recollected, that birds in general feed on insects as well as seeds, in many cases therefore, they must prove a benefit rather than an enemy to the farmer by destroying the grub, wire worm, and many other insects with which he is infested. This is particularly the case with crows and rooks, though by many, they are considered a most destructive race, Many agriculturists tell us that their whole crops would have been literally destroyed and themselves ruined, had they not taken the necessary measures of driving them from the fields. But we would enquire whether the fields in the neighbourhood of a rookery, were ever found to be thinner than other fields in the same district? We think upon an average of two out of every three years, they will be found better, cleaner, and freer from the grub and weeds, especially that of the wild mustard. Mr. Hogg gives the following instance of the benefit of rooks in clearing corn fields from this weed. "In the year 1825, our fields were so over run with the runch or wild mustard, that for six weeks not a blade of corn was to be seen, and every corn or barley field was covered as with gold: but on the Earl of Traquairs fields around the rookery there was scarcely a single plant of this noxious weed to be seen."

It is too much the practice with gardeners to destroy or frighten away the feathered race from orchards, whether in blossom or in fruit, a system most injudicious when we find that the birds which frequent orchards, particularly bull-finches, during the bloom, are not only seeking their own proper food, but are benefitting the proprietor, by the destruction of numberless insects, "the worm i' the bud" that lie in the yet unfolded blossoms, where they had been deposited until the warmth which swells the buds, acts upon them likewise, bringing forth a most numerous race in the form of caterpillars, ready to annihilate the early hopes of the owner. In fact it is a question whether the

destruction committed by birds upon the seed, is not more than counterbalanced by the essential service which they render by extirpating the larvæ of some of the most destructive insects.

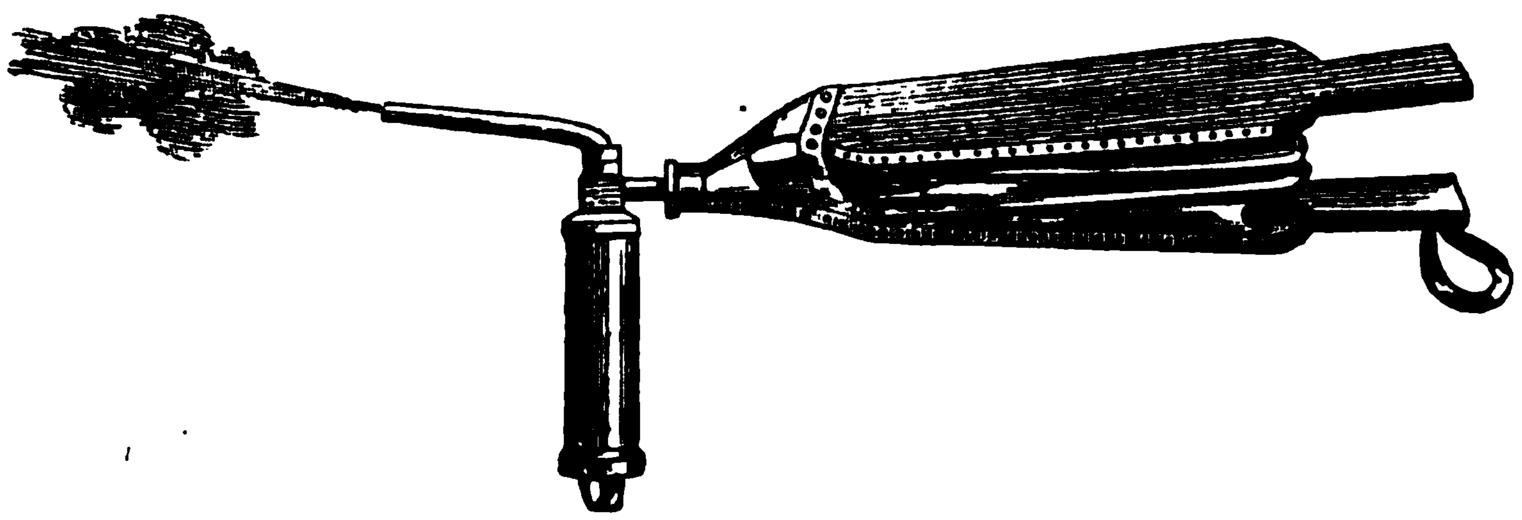
3. *Vermin of the Insect kind.*

The insects which infest plants, orchard trees, &c. are almost as numerous as the plants, or trees themselves, nearly every species having a particular insect, which it seems destined to support.

In order to prevent the introduction of insects into gardens, plantations, &c., the only means is good culture, and a judicious choice of soil and situation, if the above circumstances, are attended to it is seldom that insects will prevail to any injurious extent. But when such are beyond our controul, as they frequently are, the only alternative is to prevent their ravages, either, by their utter removal by hand, or by means of some kind of application.

As their is already an interesting article upon insects, is another part of the work by the able entomologist Mr. Rennie, and as the method of destroying them is given under the respective trees and plants, which they infest it will be useless again to repeat them, but as a general application against the ravages of that extensive genus *Aphis*, which are so destructive to trees and fruits, the following may be worthy of notice. Pour boiling water about the stems or roots of trees, or wash the stems or main branches with a liquor composed of about one fourth of quick lime and four ounces of flowers of sulphur, first carefully mixed with a little water, and gradually adding more till it becomes of the consistence of paste. It is to be put on with a stiff painters brush, any time in the autumn or winter months. It will also be found a good remedy against the moss and lichen which cover and disfigure the stems of currant, gooseberry, apple and other kinds of fruit trees.

The Acarus, or red spider, the aphides and other insects which infest currant, gooseberry, rose and other trees, may all be easily removed by means of tobacco fumigation, for which purpose *Read's Horticultural Tobacco Fumigator* is well adapted.



In using this instrument, unscrew the bottom socket of the canister, and allowing the perforated plunger within it, to fall to the opposite extremity, put in the tobacco upon it, replace the socket, hold the apparatus in the position shown by the annexed engraving, with the aperture over a piece of lighted paper ; expand the bellows and the flame rushes in and ignites the tobacco. Then by continuing to use the bellows in the ordinary way, the tobacco may be all consumed, whilst a copious dense volume of smoke issues from the pipe, and may be directed upon plants and trees in forcing houses or against walls, beds o Roses, &c. with unerring success.

With respect to the almost numberless insects which infest grain, seeds, and young plants, as the turnip fly, &c. we are rather inclined (convinced of the utter impossibility of total extermination when having once made an attack) to recommend the old adage " live and let live" for as an intelligent contributor to this work very justly observes, " insects will come, they will eat and must be fed," this gentleman, aware of the folly of counteracting nature, sows a double quantity of seed and thus insures a crop.

For the destruction of slugs, snails, caterpillars and earth worms, nothing proves so effectual as lime or lime water judiciously applied. Earth worms are found to be particularly injurious to garden walks, two or three applications of lime water, from a common garden watering pot, will completety destroy them. A pint of powdered lime will be sufficient for five and twenty gallons of water.

Grubs.

The most destructive of the insects usually called grubs is the larvæ of the cock chafer or may-bug, (*Melolontha vulgaris.*) In its perfect state as well as in the grub it is not a little destructive to the leaves of both forest and fruit trees. The female cock-chafer digs into the earth to the depth of a span and lays her eggs in a cluster, at the bottom of the excavation.

During the period of their being first deposited, and their taking the perfect state (being no less than four years,) they cast their skins three or four times.

The grub changes into a pupa, in the third year, after it is hatched. And the perfect beetle comes forth from the pupa in January or February; but it is then as soft as it was in its grub state, nor does it make its appearance above ground before May, the fourth year from the time it was first deposited by the parent cock-chafer. It is evident therefore, that during the space of four years, its work of destruction must be very great, doing immense injury by burrowing beneath the turf and soil, journeying from place to place, and devouring the roots of plants, it meets with in its way. The ravages may be greatly checked by employing a number of persons to destroy the cock-chafers in their perfect state before the eggs are deposited, but when a field is once over-run with them the only means that can be adopted with any degree of success is to pare and burn the surface or ploughing it well up, and turning in a number of ducks or other poultry, or even a drove of pigs, which are said greedily to devour them, and even fatten upon the fare. Watering the fields with stable urine by means of carts adapted for the purpose will prove a benefit to the land as a manure, as well as to destroy the grubs. Rooks as before stated, destroy great numbers.

WIRE-WORM.

This insect appears to be the larva of the clickbeetle (*Hemirhipus lineatus* and *H. obscurus*) and continues in the ground before it takes the perfect state for the space of five years, being a year longer than the grub. During the time it is under ground, it commits the most extensive ravages, feeding on wheat, rye, oats, barley and frequently attacking the larger roots, as carrots, parsnips, potatoes and salads, and is particularly destructive in new broken up land.

A very effectual remedy, is slices of either potatoes or carrots stuck upon skewers, they should be examined every day and the wire-worms destroyed, which collect upon them in great numbers.

Both the wire-worm and cock-chafer grub prove great pests to the gardener. Whenever he suspects from the stinted or drooping appearance of the plants that either of these insects are present, he should immediately grub up the plant when they will probably be found either in or near the root, or to have travelled on to the next, to commit fresh ravages.

In conclusion, it ought not to be forgotten that an acquaintance with our common noxious insects, their peculiarities, transformations, &c. is a subject of as much interest to the farmer and gardener, and ought to be as intimately connected with husbandry as the necessary knowledge of corn and cattle is to farmers in general. And we can do nothing better than recommend our readers to an attentive perusal of Mr. Rennie's interesting article upon this subject, (vide insects.) R. H. W.

VINE.

On the Culture of the Vine.

BY

Mr. W. Nicol.

The Grape Vine (*Vitis Vinifera*,) Pentándria Monogy'nia Linn.; and Vini'feræ Juss.

The varieties of the Grape Vine are very numerous; upwards of one hundred and sixty, have been described in the catalogue of the Horticultural Society, but for a small vinery, I would recommend the following selection.

1. White Muscat of Alexandria.—Rich. Vinous flavor, an excellent grape.
2. Sweet Water.—Sugary. The fruit much esteemed.
3. Royal Muscadine or Chasselas Blanc.—Rich and Vinous. An excellent bearer.
4. Grizly Frontignac.—Flavor exquisite; a rather shy bearer.
5. Lombardy [*Flame colored Tokay.*]—A good grape; of a beautiful flame color.
6. Muscadine, [*Black Frankendale.*]—Rich and juicy; a good bearer.
7. Black or old Hamburgh.—Good flavored, and a plentiful bearer.
8. Black Prince.—Bunches and berries very large; one of our best grapes.

For an Open Wall, the following List is recommended.

1. Black Cluster.—Flavor rough and harsh, well calculated for the making of wine.
2. Amber Muscadine.—Bunches rather small, but a good bearer.
3. Scotch White Cluster.—Very hardy and a great bearer.
4. The Wantage Grape.—Excellent flavor and a great bearer.
5. Lashmar's Seedling.—A new seedling white grape, rich vinous flavor, and a great bearer.

(Since receiving Mr. Nicol's communication we have been favored by the following description of Lashmar's Seedling, by J. M. Cripps, Esq. the talented President of the Brighton and Sussex Horticultural Society.—Ed.)

"Mr. John Lashmar, of Brighton, Baker, received the original plant as a seedling Hamburgh; but finding it a good flavored grape and frequently without any seed, he called it the Corinthian Grape, and gave a plant to me as the President of the Brighton and Sussex Horticultural Society. I observed that the wood was of a very luxuriant growth and therefore placed it against the S. E. Wall of my House, by the side of a Sweet Water; it was soon evident, that the sweet water grape, stood no chance with the Corinthian in point of bearing, and in respect to flavor less so; this induced me to send a bunch of each sort when ripe to the Earl of Egremont, to show how superior the new grape was in every respect to the Sweet Water, and stating to his lordship my opinion that the grape might always be ripened to perfection in England in the open air, and in most years in Scotland. His lordship was pleased to state, "it was the best sort he had ever tasted, and recommended the sending of cuttings of the same to the Horticultural Society in London, who would, he was sure, consider it a very desirable acquisition, as soon as they saw the produce," This was immediately done, and the Society expressed a wish that it might not be named the Corinthian, for fear of confounding it with the Currant grape, it was therefore named Lashmar's Seedling, in compliment to the person who first introduced it. I have no hesitation in stating, that it is the best grape for an open wall, that has ever been produced; the fruit partakes in its first appearance, of the shape of the Muscat of Alexandria, but when it begins to ripen, it assumes a globular shape, the skin is very thin, and the only defect is its liability to burst; in a house one year, it burst so much, that the proprietor was induced to have another sort grafted upon the stock. Lord Egremont however is so partial to this grape, that he has placed it in a house, and I have heard no complaint of failure in any respect. I have no doubt that a vineyard of this grape might be advantageously planted in any sheltered valley of the South Downs facing the sea, and would ripen its fruit to perfection."

Culture, &c.

Soil.

The Vine will succeed on almost any soil, provided the substratum is dry, but the finest flavored fruit is always produced on soils of a loamy nature, to which small fragments of chalk, cut turf, and a little manure has been previously added. Whilst on the contrary, the finest fruit and the largest crops are always obtained on deep loamy soils, highly manured with the strongest animal manures.

Propagated.

By seeds, to obtain new varieties and by *layers* and by *cuttings* to multiply individuals: I prefer the latter mode, for in point of future growth and durability plants raised by cuttings, are much superior to those raised by layers. Plants may be raised from cuttings in three ways, first by long cuttings, secondly by short cuttings, and thirdly by single eyes; I prefer the latter mode as described by Speechly. In selecting a proper shoot from whence to make a cutting, the following particulars should be observed; first, the eye, or bud should be large, prominent, and bold; secondly, the shoots should be moderately strong, round and short jointed; and thirdly, the texture of the wood should be close, solid and compact; but the best criterion of its maturity is its solidity, and having very little pith. Shoots about ten or twelve inches in length, should be selected at the time of pruning, and the bottom of each made perfectly smooth, by means of a sharp knife, they should then be placed into large pots, filled with light sandy earth and watered occasionally, as circumstances may indicate; by this means they will be preserved nice and fresh until the beginning of March, the usual period for planting the cuttings.

Preparation of the cuttings. Cuttings are prepared by making a clean incision in a sloping direction, about a quarter of an inch above an eye or bud, situated on the upper part of a shoot, another incision made in a similar manner, at the same distance below the eye, completes the operation; one shoot will afford several cuttings, and thus prepared they should be carefully inserted into pots of rich earth, previously prepared for the purpose, it is important that each cutting should be inserted horizontally between the mould and the *side of the pot*, in such a manner, that the eye may be covered with fine mould to the depth of about a quarter of an inch; a gentle watering is next given, and the pots immediately placed in a gentle hot-bed, where plenty of air should be daily admitted, during the first ten or fifteen days from the time of planting. The young plants will soon make their appearance, and as they advance in growth, must be frequently watered and air freely admitted, and as soon as they have attained the height of six or eight inches, it will be necessary to shift them into smaller sized pots, four, five or seven inches in diameter, when they should be immediately replaced into their former situations. In a short time, the young shoots will require support, which may be easily effected by means of small sticks; they will require frequent waterings during their future progress and all lateral shoots and tendrils should be carefully pinched off as they make their appearance. Strong vigorous shoots will be formed by the middle of June, when

they may be either removed to the hot-house or vinery, or remaining where they are, being gradually inured to the open air, may be planted against a common wall, in the months of July or August. It is no unusual circumstance to find plants raised in this manner, making shoots upwards of twenty feet in length during the first summer.

The young plants must be pruned down about the middle of December to the proper lengths required, according to the system of pruning adopted.

Pruning.

There are three modes of pruning practised by professional gardeners, first, the fruit tree method in which the plant is spread out in the fan tree manner, and treated like a common fruit tree; secondly, the long or young wood method, in which all the wood above a year old, is cut down to the stool or stock, and thirdly, the spurring-in method in which the fruit is produced from young wood grown annually, from the sides of a main shoot or shoots of old wood; either of the two latter modes are preferable to the former, and the second has been practised by me at Newick Place, for several years past with uniform and invariable success.

By means of the accompanying sketch, I purpose in the next place to] describe in as clear and intelligible manner as I am able, the system of pruning referred to, and which from its extreme simplicity may be easily comprehended by any person possessing the least knowledge of the structure of the vine and the principles of pruning.

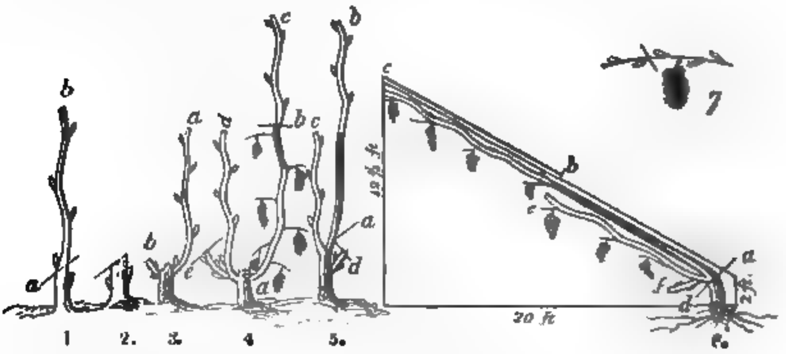


Figure 6, is a section of a vinery sufficiently capacious for a gentleman's establishment on a moderate scale. The vines may be planted about two feet, or two feet and a half apart, and as both the flue and the front wall should be built on wide arches, the roots will have liberty to extend themselves both inside and outside of the house without interruption. A grapery thus furnished, will under proper management ensure to the proprietor a remunerating crop, with plenty of fruit for his dessert during the whole of the season.

I would not however, recommend any gentleman, to build a vinery on a much smaller scale, for although the first expense may appear greater, it will I am convinced in the end be found cheaper, and much disappointment and vexation will be necessarily avoided

The pruning of the Vine comprehends both a summer and a winter's regulation and for the sake of perspicuity, I shall first speak of the

Winter pruning. The winter pruning should be performed from the middle to the latter end of December, or at the *fall of the leaf,* and this is a rule which admits of no deviation, and if acted upon, no danger need ever be excited, about the *bleeding of the vine* which only occurs when from mismanagement, the pruning is deferred until the sap is rising.

The first years pruning consists in heading down the young plant, raised as before described, to within one eye or bud of the front wall of the house at the bottom of the rafter as at *a. fig.* 1., every other bud must be rubbed off, the eye at *a.* being alone retained from which during the summer, a new shoot proceeds as *a. b. fig.* 1.

The second year this new shoot should be pruned to two eyes as at *fig* 2. Two leading shoots will thus be emitted, the strongest of which should be stopped or pinched back as soon as it has grown to the height of two feet above the middle rafter *b. fig* 6. The weaker shoot must be stopped also, but at the height of three or four feet only, for the purpose of strengthening the eyes.

The third year the leading shoot that is to form the bearing wood of the succeeding summer, should be cut down to the middle of the roof *a. fig.* 3. and the bottom shoot to the second or third eye, *b fig.* 3. The leading shoot *a. fig.* 3. bears fruit abundantly the following summer, at the lower half of the house, at the same time it sends forth a new shoot *b. c. fig.* 4. The successional shoots *d. e fig.* 4, must during their growth be pinched back in the manner described under the second years pruning.

The fourth year. The leading shoot *b. c. fig.* 4., which is to form the bearing wood for the upper half of the house the succeeding summer is to be pruned to within a few inches

of the top rafter, as at *c. fig.* 6., the second leader to the middle of the house, as at *d. fig.* 4. and the bottom shoot *e. fig* 4. to the second eye. All the spurs that have borne fruit on the old wood *a. b. fig.* 4. must now be cut clean away, and the shoot *d. fig.*4. trained neatly beneath it as represented in *fig.* 6. where *a. b.* shows the old wood completely divested of its spurs with the successional shoot *d. e.* in its proper situation below it; *fig.* 5. exhibits the vine in its pruned state, at the end of the third season, or fourth winter pruning; *a.* the old wood, or naked cane, *b.* the bearing wood for the upper half of the house, the following summer, *c.* the bearing wood for the lower part of the vinery the next season, *d.* a spur from whence to derive new shoots for successional bearing wood. In the following season, fruit will be abundantly borne from the top of the house to the bottom *a. b. c. fig* 6. the shoot *c.* is not allowed to extend itself; whilst at *e.*a new shoot is produced, which pushes on to *c.* and the bottom shoot *f.* forms bearing wood the succeeding summer.

The fifth year. The entire shoot *a. b. c. fig.* 6. having borne fruit for two successive years must now be removed close to the old stock or stool as at *a.* and the shoot *d. e.* trained to supply its place, which will afford fruit the following summer at the upper half of the vinery, whilst *f.* trained in the manner above described, supplies the lower half of the house with fruit, at the same time it furnishes new shoots, which become the foundation of bearing wood for the succeeding season.

A regular succession of pruning has now been described, and with this alternation the system may be continued for an indefinite period.

Summer pruning. During the first and second summer, no pruning will be required; in the third summer, the vines must be pinched back as directed under the third year's winter pruning, all laterals and tendrils removed as they appear, and the leading shoots kept constantly pinched back to within one eye or bud of the place at which they were originally stopped. On the fourth summer, the leading shoot *a. b. fig.* 4. will bear fruit its whole extent on young shoots of the same summer's growth, these will require to be stopped one eye beyond the fruit, as soon as it shows itself, as at *fig.* 7.

Laterals and tendrils should be constantly removed until the fruit is in flower, after which on no account must the vines be disturbed until the fruit is fairly set.

The thinning of the fruit, is the next operation, and must be performed at successive intervals according to the growth of the fruit. The first thinning may take place as soon as the young grapes attain the size of vetches, care being taken to remove the inside berries, and those of a diminutive growth. As soon as the berries press the one against the other, they must be again thinned out for the purpose of enabling the fruit to expand itself to its utmost extent. The operator on these occasions should never touch the grapes with his naked hand, but take the precaution of placing a vine leaf between his hands and the fruit, at the same time taking care not to rub the grapes with the hair of his head. The fruit should never be thinned until the moisture deposited on the grapes during the night has been completely evaporated by passing a current of air, through the house, and indeed on all occasions, it will be adviseable to admit air as far as practicable early in the morning, to prevent the spotting of the fruit produced by the action of the sun in case the moisture is not evaporated. After thinning the grapes, it will be necessary to support the shoulders of the larger branches by means of bass attached to the wires of the rafters.

With some of the black varieties, it occasionally happens that the whole of the berries do not ripen at one and the same period, and in consequence they assume variations of color in different degrees; this generally arises from a superabundance of fruit, or a want of attention to judicious watering or general management of the vine.

The time of forcing usually commences with me about the latter end of February, or beginning of March, the temperature of the house, should not exceed 55 deg. Fahrenheit in the first instance, or until the buds begin to break, after which period it may be very gradually increased from 65 to 70 deg. until the bloom begins to expand, and after the setting of the fruit it may be increased to 75 deg. or even 80 deg.

By the admission of steam, a proper degree of moisture can always be attained which is deposited upon the vine as it cools in the most gentle and equable way possible, and is certainly to be preferred to the forcible application of water, by means of a syringe in the ordinary manner.

Having thus described in as clear and concise a manner as I am able, the training and the pruning of the vine in the hot house, it may be expected that I should offer a few remarks on the training of the vine against a wall or a trellis in the open air; upon this subject however, I have only to remark, that as the growth of the vine in both cases is precisely the same, so the same mode of training and pruning is equally applicable to both. In conclusion, I may just advert to a mode of pruning by spurring-in, as it it called, as recommended by Mr. Griffin, I have partially adopted Mr. Griffin's plan, at Newick Place, and as far as my experience, enables me to form an opinion with respect to the comparative merits of Mr. Griffin's plan and the mode of pruning I have recommended, it appears to me that by the former mode, the berries are certainly larger whilst by the latter, the bunches are much finer and better shaped, the produce in either case being equal.

In Griffin's mode of training and pruning, only a single shoot is led up under each rafter. The vine is planted outside close to the parapet, and introduced through a hole immediately under the rafters, up which it is trained. On planting, it is cut down to one eye; about Christmas the shoot formed during the preceding summer is cut down to two or three feet; the second year one shoot only is trained from the extremity, and it is again headed down in winter, so that the joint length of the two year's wood is from ten to fifteen feet; and at the Christmas of the third year, the shoot is cut off at the end of the rafter.

The fruit it is obvious, is to be obtained from the side shoots or spurs proceeding from this main shoot. The spurs are cut down to single eyes every winter till the main shoots get coarse and rugged, which will happen in about ten years, it is then cut away entirely, a young stem having been previously trained up the two preceding years from the bottom to substitute in its place. As soon as the plants become sufficiently strong to furnish wood, from the point where they enter the house, for a second or third branch, then a proper number must be fixed on as permanent plants, and their side branches brought successively forward and trained to the contiguous rafters, one bearing branch being applied to each rafter, and the plants which originally belonged to these rafters taken away entirely.

The weight of grapes produced by the vine under each rafter, by this mode of pruning, is generally about forty pounds, two bunches to each spur, or from fifty to a hundred bunches averaging half a pound each. When the house is in forcing, the branches are suspended from the rafter by strings from two to three feet long, fastened to nails or hooks on each side the rafter; by this means they are let down from the glass, when danger from frost is apprehended in the manner effected by the hinged rafter-trellis. "I also contrive," adds this very successful cultivator "to spread the branches, when in bearing on either side of the rafters, under the glass; but so as not to occupy the whole space under the glass with the foliage, for I consider that very great advantage arises to the fruit from giving free admission to the sun from the centre of each light. It will be asked by some gardeners what is done with the leading shoot at the end of every main stem? This Griffin stops during its growth in the summer, leaving three or four joints at the utmost; and these must be cut away at the time of pruning, down to the old wood or nearly so; sometimes to prevent the top of the house from being crowded, a little of the old wood at the top may be cut off also, and replaced by the next year's shoot.—*From the Horticultural Transactions, vol.* iv. *Enc. Gard.*

USE.

The uses of the vine are too well known to require any notice from me, the fruit in its ripe state, is principally employed for the dessert; and from the leaves, tendrils and immature fruit, an excellent wine is often made.

WALNUT.

Walnut (*Júglans Régia*) Monœ'cia Polyándria Linn. and Terebintháceæ, Juss.

The walnut tree is a native of Persia and China, and is stated to have been introduced into this country, in 1562. Independent of its valuable wood and fruit, it has very just pretensions, as an ornamental tree; its general habit, as well as its beautiful lobed leaves, associating so well with garden and park scenery.

There are several varieties of the cultivated walnut; but those generally cultivated for fruit, are

1. *The Highflyer of Thetford,* noticed in the Hort. Trans. vol. iv, by G. Beauchamp, Esq. as by far the best walnut grown. The kernel is full, very tender, and high flavored.
2. *The round early oval*
3. *The tender shelled*
4. *The thick shelled*
5. *The double large French.*

Culture, &c.

SOIL.

It thrives in almost any soils that are not too wet, but it attains the greatest bulk in such as are rich and deep. In loamy or light clayey soils, it attains a good timber size within a century.

PROPAGATED.

1. *By seeds, or nuts*—which should be gathered as soon as ripe, and either sown immediately, or packed in boxes of sand till spring. Upon this subject, Miller observes—

" All sorts of walnuts, which are propagated for timber should be sown in the place where they are to remain ; for the roots of these trees always incline downwards, which being stopped, or broken, prevent them aspiring upwards, so that they afterwards devaricate into branches, and become low spreading trees. But such as are propagated for fruit are generally improved by transplanting, for they are rendered more fruitful, and the fruit is therefore larger and better." Evelyn, who wrote previously, says, " that those who plant nuts for the sake of the fruit, should place a tile below the nut, that the roots may be obliged to spread out horizontally.

The Nursery practice of rearing walnuts is to sow the seed either when gathered, or in the month of March or April following, in beds of moderately rich ground. They may be sown in drills from nine to twelve inches apart and two inches apart in the rows, taking care to place them two or three inches deep, and to earth them well in.

2. *By in-arching, or grafting by approach.*—This practice has been adopted with considerable success by Mr. Knight ; and plants, thus treated, have come into a bearing state, in the third succeeding spring. Budding has also been resorted to by the above gentleman and with equally favorable results.

Tree.

1. *Transplanting.*—In transplanting walnuts, either into nursery lines, or at a future period of their growth great care should be taken that their roots be as little injured as possible. They may be transplanted into nursery rows, when of one year's growth, a foot asunder, by six inches, in the rows, there to remain two years, and then again transplanted at a greater distance into other nursery rows. Their final removal should not take place before they are from eight to twelve years old, The best time for transplanting, is in autumn, as soon after the foliage drops as possible ; and trees of a small size will generally succeed better than such as are very large.

Pruning.—The pruning of nature is perhaps the best for this tree, the lashing of each others branches being generally sufficient to effect what the pruning knife could not have done without injury to the timber. In some cases, however, the knife judiciously used, may be of advantage in regulating any casual growth, and removing over-extending branches.

Use.

1. It is principally cultivated in this country, for its wood, being used for many useful purposes in the cabinet and joinery branches, but more particularly for gun stocks.

2. *The fruit.*—when intended for the table, should be gathered when sufficientiy ripe, and then laid in heaps a few days, to ferment, when the green envelope will readily separate from the nut, which should then be kept in a dry room, or in boxes, or tubs of sand for use. The fruit, in its green state, makes an excellent pickle.

3. The kernel furnishes an oil, which is used by painters for mixing whites, and other delicate colours ; and for gold size and varnish.

4 The bruised leaves, soaked in water, are used by fishermen to draw worms from their holes, to which gardeners sometimes add the husks and the water on grass plats, gravel walks, &c. to kill them.

WEEDS.

WEEDS OF AGRICULTURE.

Weeds are commonly divided into three classes—*Annuals*, which continue only one year, the plants dying after the seeds are perfected ;—*Biennials*, which continue two years, and die after maturing their seeds the second year ; and *Perennials*, which continue in existence several years. Many of these are propagated both from the root and from the seed.

These different sorts of weeds are found in corn fields ;—in grass-lands,—in hedges,—in waste and uncultivated lands,—and in woods and plantations ; and even gardens, notwithstanding the care bestowed on their culture, are not exempted from them.

1. *Corn Fields.*

In a list given by an intelligent author, of the weeds which infest our corn-fields, no less a number than fifty-five are enumerated. Fortunately, their extirpation can in general be accomplished, by nearly the same processes.

Means of destroying Annual and Biennial Weeds.—The most effectual means of ensuring their destruction, on strong land, is by a clean and thorough summer fallow; or by the culture of turnips, potatoes, or tares, in rows, and kept perfectly clean, on light soils; but, for the attainment of that object, it is necessary, 1. To bring the seeds within the limits of vegetation; and 2. To destroy every weed which vegetates.

1. Seeds of an oily quality, such as those of charlock, (wild mustard), and several other annuals, will remain for a long period of time in the ground, capable of vegetation, when acted upon by moisture and heat. It is absolutely necessary, however, to make them germinate, before their destruction can be effected. This is accomplished, by the operations of ploughing, harrowing, and rolling, by which the ground is pulverized, and a vast number of seeds are brought so near the surface, as to promote their vegetation. In fallowing those processes should be performed early in the season, when the powers of vegetation are the greatest, and the weeds most likely to come forward.

2. When the first crop of weeds appears above the surface, a second ploughing should be given, by which that crop will be instantly destroyed, and a foundation laid for producing another crop of weeds. Harrowing, and where there are clods rolling, should also be resorted to after every ploughing; and in this way, several crops of weeds may be destroyed, in warm and moist seasons, before the succeeding crops are drilled. During the growth of those crops, both the hand and the horse-hoe should be constantly employed; and the greatest care taken, to prevent all weeds from running to seed.

As the several hoeings given to the cleansing crops, destroy every annual weed as fast as it appears, if the seed furrow, for the crop which succeeds, be not ploughed or scarified deeper than the last furrow given to the cleansing crop, (and a greater depth is then unnecessary), few weeds will appear in the crop of grain which follows; but as the clover stubble, which follows the grain crop, must be ploughed a little deeper than the seed-furrow formerly given, a fresh growth of weeds may then be expected. To get the better of these enemies, some farmers hand-weed these crops, at an expence of from ten to twenty shillings per acre, and have found it much to their advantage; while others have resorted to the drill husbandry, and in that manner have been enabled to destroy them in a satisfactory manner.

By an attention to these measures, the quantity of weeds is regularly diminished; and many farms, which forty years ago, were a nest of seed-weeds, are now brought into such order, that these injurious plants no longer materially impede the growth of corn.

Means of destroying Perennial Weeds.—These are by far the most difficult to eradicate, as several of them propagate both by their seeds and their roots. Under this head are comprehended, all the weeds to which the common name of *couch* is given, one of the greatest banes that husbandry has to contend with. Couch is sometimes so interwoven in the soil, when the land has been long in neglected tillage, as to form a perfect matting. Its destruction can only be effected, by an early and complete summer fallow, when, by repeated ploughings, with sufficient harrowings between each ploughing, the roots may be worked out, and brought to the surface.

It is proper to observe, that the destruction of root-weeds, as couch, and seedlings, as charlock, must be effected, in arable land, upon different principles; the former, by working them out of the soil in dry weather only; the latter, by pulverizing the soil; so as to induce the seed to germinate after rain, and afterwards ploughing in the young plants.

Among the perennial weeds affecting arable land, thistles, docks, wild oats, and coltsfoot, or tussilago, require particular attention.

The common thistle (*serratula arvensis*, Linn.), is extremely injurious to all crops. It is for a time repressed, rather than destroyed, by a well-conducted summer fallow; but that is only a local remedy; for its numerous seeds, which are feathered, will often come from a considerable distance, and replenish the field that has been cleared. It is frequently cut close above the ground, by means of a very simple instrument, called a weed-hook; but it, is done much more effectually, either by the hand, or by means of a pair of forceps, or nippers, with two long handles, by which the whole, or part of the roots are pulled up, and the plants either much weakened, or totally destroyed. In Derbyshire, they make use of a species of tongs or pincers, with *fluted jaws*, which must be peculiarly effectual.

The dock, (*Rumex acutus et obtusifolius*), is a hardy perennial, very tenacious of growth by its roots, and producing a great increase of seeds. In arable land, the roots should be carefully picked off during the tillage season, otherwise they will produce vigorous plants, drawing much moisture and nourishment from the soil, to the injury of the intended crop. Docks ought to be pulled up by hand, after heavy rains, when the soil is soft enough to allow their long tap roots to be extracted without breaking, and long before the seeds approach towards ripeness, or even before they blossom. If the season be too dry for that operation, they ought at any rate to be cut and carried off.

The wild oat (*avena fatua*), is a most troublesome weed to a farmer, and difficult to be eradicated. It formerly abounded so much in some districts, as to constitute one half of the crop. A farmer cleared a field of this weed by a most singular experiment. He dressed and manured it thoroughly, and sowed no crop, trusting to the oats. They grew up most abundantly. He cut them for hay, before the seed was ripe, and the field

was never afterwards infested with that weed. Wild oats have likewise been extirpated by irrigation.

Coltsfoot, (*tussalago farfara*), was long accounted almost unconquerable, even by a fallow, the seeds ripening so early in the spring, that they were usually shaken before the ground had got the second furrow. It is now, however, ascertained, that there is little difficulty in subduing this noxious weed. For that purpose, the plants must be destroyed in August, September, or October, after the crops of corn are cut, at which time they are at their full growth, and easily discovered. They ought then to be pulled up, and every stock, or root, that can be laid hold of, carried off. This should be done most carefully, for about an inch below the surface, the roots have a number of buds about the size of a pea, which, if allowed to remain till next spring, will flower, and shed their seeds, in spite of every precaution. This plan should be persevered in for a few years, to give the experiment a fair trial.

By these means, more especially if accompanied by drilling, cultivated fields may be cleared from the dominion of weeds; and though these several processes are troublesome and expensive, yet they cannot be dispensed with, as they are the only sure methods known of eradicating weeds, for the plan of ploughing them in, (which, at any rate, can only answer in very deep soils), cannot be depended on.

The clearing of arable lands from weeds, may in general be accomplished by 1. Complete and well-managed fallows, whenever that operation is required; 2 By taking care that the manure used is free from the seeds of weeds, or any roots that can vegetate ;, for which purpose, fermenting dunghills is advisable; 3. By a careful choice of clean seed-corn; 4. By short tillages, or not taking too many crops in a rotation; 5. By drilling crops, in soils applicable to that culture; 6. By attentive hand-weeding, and a spirited use of the hoe; 7. By the strictest attention to the choice of seeds, particularly those of grass, that no weeds are intermingled with them; 8. By weeding the land while in grass, so as not to suffer the seeds of any injurious plants to spread themselves; and, 9. Upon breaking up the land, by pursuing such a system of cropping, as will not increase or encourage weeds, and in particular, by adopting rotations in which green crops shall predominate.

On the subject of weeds in arable land, it is highly material to observe, that their seeds are often mixed with the grain, and when ground with it, render the bread unpalatable and unwholesome. Such weeds are universal enemies, from whose mischevous attacks no individual is exempted, and whose destruction, it is every one's interest, as well as duty, to promote.

2. *Grass Lands.*—It is difficult, in some cases, to discriminate, in meadows and pastures, the useful plants, from those that are injurious; but amidst the great variety which nature produces in such lands, there are several, which are not calculated to feed domesticated animals, and ought therefore to be removed, for the introduction of others better adapted for that purpose. No person of common understanding, would ever think of allowing the live stock of his neighbours to feed upon his pastures, as the diminution of food to his own stock, by that circumstance, would be sufficiently obvious. A little consideration however, may convince every individual, that a multitude of weeds, interspersed among his grasses, produce effects not less mischievous than those that would ensue from such depredations of live stock.

Above twenty different kinds of weeds infest grass lands, besides about thirty more, of less importance, whose characters are doubtful, or whose uses are not ascertained. Some of the most worthless, as the rush, (*juncus*), and the sedge tribe (*carices*) may be got the better of by draining; others, like the mosses (*musci*), either by cultivation or manure; but there are a few which require individual attention, before they can be eradicated, in particular, the dock, the thistle, and the rag-weed.

The dock has been already mentioned as a weed in arable lands. It is equally injurious to grass, both on account of its seeds and its roots. Its seeds are exceedingly numerous, and heavy, but the stem is flexible, and the recoil from a blast, with a high wind, spreads them to some distance. Docks are found to vegetate equally on turf, and on naked mould. Every bit of root forms a new plant, even after the heart has been consumed by a species of caterpillar. To eradicate this plant in grass lands, the root must be completely taken out by the dock iron, on, or before the time of flowering, and thoroughly destroyed: this can generally be effected, after much rain. They are refused by cattle; but are eaten by fallow deer, which prevents their flourishing in parks. This plant is best exterminated when the ground is in pasture. It is said, that if it is cut in June, and the operation repeated as soon as the second shoot appears, the root is found to decay, and that it will not germinate a third time.

Thistles have also been mentioned as infesting arable lands. They are generally weeded out of the corn, but are too frequently left in full possession of the grass land, by which much damage is incurred; yet these weeds are most successfully eradicated when the land is pastured, as they then stand detached, and can easily be destroyed. The thistle ought to be torn from the main root every year, when the plant is in its greatest vigour; the root itself is thus injured, gradually decays, and the plant is ultimately got rid of.

The rag-weed (*senecio jacobæa*), infests some fields more than the thistle, more especially when the soil is sound or dry, for it is seldom to be met with in wet lands. The only

effectual mode to destroy rag-weed, is to pull the plant up, just before the flower expands, which is commonly very practicable, as its fibrous roots do not penetrate deep, and are easily taken out, after a plentiful shower.

SIR J. SINCLAIR.

GARDEN WEEDS.

Are best eradicated by frequent hoeings and hand weeding.

"One year's good weeding,
Will prevent seeding;
But one year's seeding,
Makes seven year's weeding."

WHEAT.

Wheat (*Triticum*) Triàndria Digy'nia Linn. and Gramíneæ, Juss.

Wheat is, unquestionably, one of the most important grains subjected to culture. It has been cultivated from time immemorial in Britain; but it is a matter of uncertainty from what quarter of the globe it originally proceeded. It is supposed, by some, to be a native of Asia and Africa; but all that has been hitherto advanced upon the subject, is merely conjecture.

There are seven distinct species of *Triticum* cultivated for their grain, besides many varieties and sub-varieties. The species and sub-species according to Loudon,(*Encyc. Agric.*) are

1. Summer or spring wheat—*Triticum Æstivum*
2. Lammas wheat—*Triticum Hybernum.*
3. Egyptian wheat—*Triticum Compositum.*
4. Turgid wheat—*Triticum Turgidum.*
5. Polish wheat—*Triticum Polonicum.*
6. Spelt wheat—*Triticum Spelta,*
7. One grained wheat—*Triticum Monococcum.*

The *first, second, fourth,* and *fifth* sorts are by many botanists considered as only varieties, and it is doubtful whether the *third* and *sixth,* may not be the same. The *seventh* has all the marks of a distinct species; but it is very questionable whether, if much cultivated, it would always continue to produce one row of grains.

The spring or summer wheat —is distinguished from that generally sown by its narrower ears, longer beards, smaller grains, and shorter and more slender straw, and also that it will not indure our winters. It is commonly sown in April, or even so late as May. It was known to Parkinson, in 1666, but has never been much cultivated. It was tried and given up in Northumberland, and Mid-Lothian, and also in some counties near London. Many varieties of summer wheat were transmitted a few years ago to the President of the Board of Agriculture, from the Agricultural Society of Paris for the purpose of experiment, and were divided among many distinguished agriculturists; but there has not yet been time for establishing their comparative merits, or their adaption to the climate of Britain. Summer, or as it is often called, spring wheat, has, however, been long and extensively cultivated in some parts of England, particularly in Lincolnshire; and it is probable it may be found a valuable crop in the southern counties; but the trials that have been made in the north, do not seem to entitle it to a preference over winter wheat, sown in spring, or even oats or barley sown in that climate.

Of the winter or common wheat.—There are a great number of varieties. Professor Martyn, in Miller's Dictionary, has described 49 sorts; and Professor Thaer speaks of a hundred, but affirms that those who describe them know nothing about them, and, in all probability, include one sort under different names. All the varieties may be reduced to two,—the white, and the brown, or red grained. As subvarities, there are the beard and beardless, the wholly chaffed, and thin or hairy chaffed, both of the reds and whites. To these, some add another variety, which is the spring-sowing common wheat. It is stated by those who maintain that this variety exists, that through long sowing, the progeny, after a number of generations, acquires a habit of coming earlier into blossom, than seed from winter-sown grain. This we think very likely, but are not aware that the variety is distinctly known by any recognizable marks in the plants. The red or brown wheats are universally considered as more hardy than the white, but as yielding an inferior flour. The woolly white is supposed to yield the best flour; but woolly-chaffed wheats are considered as more liable to the mildew than any other.

The Egyptian or many-spiked wheat—the turgid grey pollard, or duck-bill wheat, and the Polish wheat, may, for all agricultural purposes, be considered as only varieties of the common winter wheat. They are cultivated in a few places in England, and seeds of them may be procured from the public botanic gardens; but they are in little estimation

Spelt wheat.—The *epautre* of the French is known by its stout straw, which is almost solid, and by its strong spikes, with chaff partially awned, the awns long and stiff. The chaff adheres so close to the grain as not to be separated without great difficulty. This grain is a good deal sown in the south of Europe. In France it is sown in spring, on land too coarse for common wheat, and it ripens in July and August. It is the principal wheat sown in Suabia, and the north of Switzerland, and is a good deal sown in Spain. The grain is light, and yields but little flour; but it is said to contain a larger portion of gluten than common wheat, and for that reason is recommended as superior to any other in pastry and confectionary. It is not cultivated in Britain.

The one-grained wheat—is known by its small thin spikes, and single row of grains, the leaves and straw are remarkably small, but very hard; and the plants tiller remarkably It is chiefly cultivated in the mountains of Switzerland, where its straw, like that of the former species, is much used for thatching. The grain makes a brown light bread; but its great excellence, according to Villers, is for gruel.

Estimate of Sorts.

The thin-skinned white wheats are preferred by all the best British farmers, whose soil and climate are suitable for this grain, and for sowing in autumn. In late situations, and less favourable soils and climates, the red varieties are generally made choice of, and these are also generally preferred for sowing in spring. Red wheats, however, are considered as at least fifteen per cent. less valuable than the white varieties. No subvariety ever continues long in vogue; nor is it fitting that it should, as degeneracy soon takes place, and a another and better is sought for as a successor. Hence, the only recommendation that can be given as to the choice of subvarietes, is to select the best from those in use among the best farmers in the given situation, or nearest well cultivated district.

Culture, &c.

Soil.

The soil best calculated for this species of grain is the strong clay, heavy loam, or marl lands; it may, however, be cultivated on almost any soil. Although a light sandy soil sometimes produces an excellent crop of wheat, it is not to be recommended; such soils being better adapted, and more congenial to the growth of crops of another description.

Propagated.

1. By seed.—Sown either broad cast, in drills, or by dibbling. The first method is, by far, the most general, and, with very few exceptions, universally adopted, the seeds being, for the most part, covered by the harrows.

Time of sowing the winter or autumn wheat.—The earlier the wheat can be sown in autumn, upon *strong clay, or cold soils*, the greater chance the plants will have of obtaining strength in the ground before the frost sets in, a circumstance upon which the future growth of this crop greatly depends, independent of the soil being in a better state for vegetation. Wheat sown late, seldom succeeds so well as that sown early, but if put in too early, there is danger of the crop running to straw, or becoming what is called *winter-proud* and the grain proving light in the ear. From the middle of September to the end of October, upon the above soils, is considered the best time for sowing *On strong loams or deep hazle moulds*, it may be deferred to a considerable later period, as upon warm or rich soils, there is danger of the plants being forced too forward, and consequently they become weak and spindly. In the spring months from the beginning to the end of November, will be found the most desirable time for sowing wheat upon soils of this description; the same time of sowing will also be suitable upon chalks, and dry gravelly soils.

Time of sowing spring wheat.—The culture of spring wheat is not much to be recommended, but in some instances, and under certain circumstances will be found profitable, for instance when turnip or other crops cannot be got off soon enough for autumn sowing, but even, in this case, a barley or oat crop would be sown to a greater advantage. About the middle of March appears to be the best time for sowing this description of wheat.

The quantity of seed to be sown per acre—varies considerably according to circumstances such as the time, the state of the land, and whether broadcast, drilled, or dibbled. Early sowing requires considerably less seed than that of the late; poor lands mose than rich; broadcast more than drilled; and dibble less than either; the quantity varies accordingly; if sown broadcast, from 2 to 4 bushels per acre; if drilled, from 2 to 2½ bushels will be found sufficient (for method of drilling, see drilling). For dibbling, less than two bushels will suffice.

Preparation of the seed for sowing.—The process of steeping the seeds before sowing is indispensably necessary on whatever soil it is intended to be sown; if this be not done, in nine cases out of ten the wheat will be afflicted by the disease called smut. Most farmers are agreed as to the necessity of steeping the wheat, but are not quite so unanimous as to

the kind of steep, and method of steeping it. A solution of salt and water, (sufficiently strong to float a hen's egg, so that a portion of the shell may appear above the liquor, to the size of half a crown;) or a moderately strong mixture of arsenic and water, are considered by most farmers excellent steeps for the purpose. The opinion of agriculturists appear to be divided as to whether the seed should be suffered to remain a long or short time in the steep, or the steep merely sprinkled upon it. We are inclined to recommend steeping but for a short time, for this reason, as the seed that has been long soaked will infallibly loose its vegetating power, if not sown immediately after being taken from the steep.

The method of steeping.—Pour the seed gently into a tub, containing either of the above steeps, which will cause the chaff and the thin and useless corns to float on the top, which should be carefully skimmed off, it should then be taken out of the tub, placed in a heap, or heaps, and a portion of fresh slaked lime, sprinkled over it as it is thrown out of the tub, and well mixed, which will not only accellerate the vegetating power of the grain, but will contribute greatly to prevent the smut. The corn should lie in the lime during the night previous to being sown.

Preparation of the land.

On strong clay lands, it is generally considered necessary to make a good summer fallow for a wheat crop, For the following information on the system of fallowing, I am indepted to my friend Mr. J. Hitchins, Land Surveyor, Brighton.

Various are the opinions of the best informed practical agriculturists, as to the advantages to be derived from adopting the fallow system, and particularly as to its being essential to good husbandry; some contending that land should lay a barren fallow; others admitting the advantage of occasional fallows, and those at very distant periods, while a third insists that, without adopting a regular rotation of fallows, the good condition of the land cannot possibly be maintained; and that although by artificial means an equal quantity or even more straw than by the regular fallow system may be obtained; both the quantity and quality of the grain will be deficient. With these conflicting opinions, therefore, although derived from practical authority, it is most important to pause previous to becoming converts to either, and to well consider the many, and powerful arguments each party have adduced, in advocating their several opinions, ever bearing in mind the old maxim "that there is no rule without an exception," which, in considering this important subject, will be found most forcibly to apply, for it is quite evident that a course of husbandry, which on one soil would be found most beneficial, on another would be perfectly impracticable; so, by the same parity of reasoning, the arguments for and against the fallow system should be cautiously received; upon which no positive but general directions only can be laid down. Although soils and situations are the grand directors to the different systems that can or ought to be pursued, yet much is to be overcome by perseverance, aided by a right judgment, which on a hasty view may appear impracticable. It is evident, therefore, that the agriculturist should well consider the soils and situations with which he has to contend, and to exercise great caution before he is led away from a system that has heretofore worked well, in order to enter upon a new one, without previously satisfying himself by repeated trials, on a small scale; the want of doing which, too often misleads the theorist, and runs him into errors which more guarded caution would prevent. Instead, therefore, of blending the various soils under one general head, I will consider the different descriptions with which I am acquainted, separately, in as concise and intelligible a manner as possible, the result of 30 years practical experience, both as an agriculturist and land surveyor, each of which have necessarily engaged my attention under more favourable prospects to the British agriculturist than at the present period.

That a very great alteration has taken place in the state of the agriculturist, must be manifest to every one. The price of his produce is no longer such as to justify extensive operations, by way of experiment, and the heavy pressure of the public burdens, adds to the general inability to engage in speculative researches. During the long and expensive wars, which were carried on upon the Continent, various circumstances combined to raise the price of agricultural produce; these having altered, with the altered state of the country, a new era has commenced,—the corn of England is no longer wanted for foreign nations,--and the home market, is that alone which the agriculturist has to supply. In addition, may be noticed the great diminution of the expenditure of Government; much of which, during the war, acted as a stimulus to agriculture. The consequences of this change, are but too visible thoughout the whole of the farming interest.

In my opinion, the improvement of agriculture rests on the same basis as the improvement of trade and commerce. No advantage to the one, can, by possibility be permanent, unless it be accompanied by advantages to the other.

Each fills up its particular station in the national economy, and he who would restrict one, or stimulate the other by calling the powers of legislation to its aid, creates much greater evil than good. The great object of the agriculturist, as well as the manufacturer is to procure numerous and wealthy customers, and the ways by which these are to be procured, are by both interests uniting in a general endeavour to promote the security of property, the freedom of industry, the diffusion of sound information, and above all, moderation in the public expenditure.

At the same time we are free to admit, that the cultivator of the soil, is exposed to many vexations, and harrassing imposts, which press heavily on his peculiar employment. It is known that three fourths of the lands of England, and Wales, are exposed to claims, which wrest from the husbandman one tenth of the gross produce of his labour, and capital, and this, whether the remainder of the produce be, or be not, sufficient for his remuneration. We need scarcely mention other topics, to which, the minds of our readers will involuntarily be turned, and which prevent that degree of just reward, and comfort, so laboriously toiled for by the Working Farmer. We are well aware, that an idea is prevalent with some, that a man may become a farmer without education or study. This may perhaps be the case, where the business is carried on according to a system of routine. But where an improved plan of agriculture is practised, we are inclined to think with Mr. M' Culloch, "that skill and attention are alike indispensible and that there is indeed no employment, where intelligence, industry, and that prompt activity "which has no such day as to morrow in its calendar, can be less dispensed with."

With this digression I will now confine my observations to the matter on which I set out, and in doing so, shall avoid all ambiguous or chemical terms; as but few in proportion to the great mass of the agricultural body, have devoted their time and attention to the study of chemistry, although it is highly essential to a proper knowledge of the qualities of the earth, and its capabilities.

My object being to assist plain agriculturists who have been unable to devote their time to the study of that important object of research; I will, therefore, begin with the old school, many of whom are decidedly of opinion that unless land of almost every description is fallowed in regular rotations, that the good condition of it cannot be maintained; whilst many of the new school contend that by proper management it is unnecessary ever to have any naked fallows, and others but rarely so. From my own observations, however, I am decidedly at issue with each of them; for although I am quite satisfied that, by a judicious course of management, it is perfectly unnecessary ever to have a naked fallow on some particular soils; and that such lands may be maintained in an equally high condition without it; still, I am fully convinced that, however well managed other lands may be without occasional fallows they cannot be maintained in proper condition, of which I have made many trials, and witnessed many experiments of the most convincing description. Where, however, the drill or dibbling system can be pursued, and is judiciously conducted, the horse hoe will do very much to keep the land in a clean and mellow state; but even that, on certain soils, has its limits, and will be greatly benefitted by an occasional fallow. There are other soils where the drill husbandry cannot be pursued with any prospect of advantage, from the extreme adhesive nature of the land; such being when dry, so perfectly stubborn that the horse hoe will not penetrate it, consequently such land must be made fallow, in proper rotation, as the only means of keeping it free from grass and weeds. There is another soil, where, although the horse hoe will work freely, it will not admit of the top or crust being broken between the corn drills, without great risk to the crop, in dry seasons; I mean light chalk land, which, however, should never be made a naked fallow, but sown with green crops, for the feeding of sheep and cattle; and with such the condition of the land will be improved. The term, fallow, is, however, too generally and incorrectly used; much land being said to be fallows that will not admit of the term: a clear fallow being when the land is altogether barren and unproductive during the year. They are termed a winter fallow, or a summer fallow; the former is land broken up in the winter, and sown in the spring; the latter when broken up in the spring of the year, and laying barren the whole of the summer, to undergo fermentation, and a correction of the crudities of the soil. Another—a turnip or rape fallow being generally broken up in the autumn, or winter, and laying fallow till the proper time of being sown for sheep feed. Another is termed a bastard fallow, that is when the land is ploughed up after the crop is cut or fed off the land, and is barren for a short period only in the latter part of the season.

Having explained the several descriptions of fallows, I will now submit my opinion on the course best to be pursued, commencing with soils of an adhesive nature, such as wet clays, which vary both in quality and appearance with subsoils equally various; on many of which the drill system can be pursued to considerable advantage, but there are others on which too many unsuccessful attempts to adopt it as a system, have in vain been attempted, though where practicable, I would strongly recommend the drill system being carried on, in preference to any other, but not so unless it is well conducted, and the horse-hoe kept close at work; but even under the best management, I am of opinion that an occasional clear fallow should be made once in seven or eight years. Others there are which so retain the water as to be too wet in the spring to use the drill, and afterwards become so hard and crusted as to resist the use of the horse-hoe. On such lands, I consider the most beneficial course to be pursued, is to make a clear summer fallow, once in four years, at the least, whenever intended for wheat; alternately taking a green and a white straw crop, by which means the cultivation of the land for wheat is rendered much easier and less expensive than by adopting the fallow system only. These soils should not be broken up until the spring, nor then, until they have arrived at a state that the

furrows will break freely under the plough; as when it is broken up before it gets sufficiently dry, it subsequently requires much extra labour; whereas, by a short but seasonable delay, not only considerable expence will be avoided, but expedition obtained, as when broken up in a wet state, it will frequently become so hard and stubborn as to resist almost any force that may be used to reduce it; but on the other hand, great caution should be used that such lands do not become too dry before the ploughing is performed, as in that state the ploughing will, with difficulty, be effected and that too in a very imperfect manner; though there are particular seasons which will baffle the most cautious and well informed husbandman. I also consider that although harrows and rollers are required to reduce the land at proper seasons; that these are much less required on strong stiff soils than is generally supposed, (except were subject to summer weeds) and that much of the labor given would be better employed in giving the land an extra ploughing and would be found more beneficial; though I am fully aware that the opinion of many practical men is quite at variance with this doctrine. I have, however, very frequently tried it by dividing a field, and never yet saw where I had bestowed so much labour in endeavouring to pulverize the clods, that a proportionate benefit resulted from it, as from an extra ploughing; which leaves it in a better state for landing up, for the purpose of receiving the seed. Peculiar circumstances and seasons, however, may render much extra labor necessary, which generally arises from want of due precaution, when the first ploughing takes place. As regards the winter fallowing of such lands, I confess I have never seen much good result from it; but often great evil; for, unless it is particularly well laid up, and the water furrows kept well cleaned out, so as to carry off the heavy rains as soon as they fall, it frequently becomes so saturated as to greatly delay the spring ploughing, and thereby loses the benefit of the early sun and wind. In order to avoid having too much stiff land under the plough, in the winter season, which is a great error: I would advise that part of such lands, as are intended for wheat, be sown with winter tares, and ploughed in, just as they come into bloom by which means the land will be rendered in a more mellow state for the future ploughing; besides it is a cheaper way of manuring the land, and particularly if intended to be manured with lime, as a much less quantity will be found sufficient, from its feeding on the vegetable matter; which, too, will decompose faster upon the lime being incorporated with it. There is a stiff red clay, found on the hills, some of which are of a very stubborn description, and full of flints, which requires to be treated very differently from the former. These lands should be invariably ploughed up early in the autumn, to receive the frosts, by which means it becomes more friable as a summer fallow, and rendered fit to be sown with turnips or rape, to be succeeded by spring corn; but that which is intended to be sown with wheat, should either be made a naked winter and summer fallow, or else sown with tares; which, after being mowed or fed off with sheep, is then made a bastard fallow; but these lands cannot by possibility be maintained in a good and proper condition, (being disposed, generally, to summer weeds) except by making clear or naked fallows, at proper intervals, as the drill system cannot be practised to advantage, from the quantity and size of the flints intermixed with the soil. The more friable soils, such as hazel moulds, sands, loams, and gravels, I consider may be well maintained by following the drill system, and taking green crops each other year, of turnips, rape, potatoes, mangold wurzel, cabbages, and the like, without ever being a naked fallow; they should be ploughed up early in the autumn, to receive the frosts, by which they come earlier and better to hand in the spring, besides which they thereby imbibe a certain quantity of moisture beneath the furrow, which is desirable to assist vegetation during the summer; they should never be ploughed deeper than when first broken up; as such will let in the sun and wind, and cause the moisture beneath to evaporate; the effect of which is often seen where the land is not broken up till the spring, the vegetation being earlier checked than it otherwise would have been. On such soils, rye, or winter barley, may be sown to great advantage, and may be fed off in the spring, when intended for turnips, and immediately after being fed off, they should be ploughed up and harrowed down; by which means the vegetation of the weeds immediately takes place.

This, however, only applies to soils that are of a dry nature, for, as I have before observed, on wet stiff clays I do not recommend so much harrowing and rolling as is generally practised in order to reduce it; on the other hand on dry soils, the reverse course should be adopted by freely using both, and as speedily as may be after ploughing. The following, practice is but very rarely adopted, namely, that after the land is well consolidated and sufficietly prepared, to give it one extra ploughing. If the same can be done however in proper season, whether for wheat, turnips, or other green crops, it will well remunerate the agriculturist for the extra expense."

By fallowing, a clay farmer may best depend on a good crop, as during the fallow process, the land may in every respect be brought into proper order; lime and other manures may be applied at a proper season and thoroughly incorporated with the soil, besides it is impracticable to sow wheat, extensively on clay lands, unless the land has been sufficiently prepared during the summer months. Another advantage in summer fallowing, is that less manure is required, this is an object of much importance, a scarcity of manure being the greatest evil

an arable farmer has to contend with, likewise the land by making a clear summer fallow, may be freed from all kinds of rubbish, which would be almost impossible, to be done in any other way, besides rendering it in better condition for future crops. *Heavy loam and marles*:—Wheat may be grown on these soils, either after peas, beans, or any green crop, fed, or mown off the land, which is an excellent preparation provided the former be drilled or dibbled at a proper distance to admit of the horsehoe or break being worked between the rows which should be continued as long as the beans do not receive injury from it. Immediately after the beans are taken off, the broad share should be applied in a contrary direction across the rows and well harrowed, the same process should be pursued after peas with the broad share and harrowing, after which one ploughing will be found sufficient for the reception of the seed.

Upon light soils, wheat will succeed best on a clover lay on one ploughing, sowing it after a fresh furrow; it will do well after turnips, tares, or rape, if fed off and folded with sheep, one ploughing only after these crops will be quite sufficient, as by more frequent ploughings, the land would become too light and mellow, and in sharp frosts the wheat would be drawn out of the ground, on very light soils it is adviseable to use the presser before putting in the seed (if sown broadcast), but it will frequently be found the most advantageous plan to drill in the wheat from two to three inches deep, and by some, folding sheep on the land immediately after sowing upon the above soils, is highly recommended, as this description of land cannot be got too close and firm for the wheat.

After Culture.

The after culture of Wheat greatly depends on the land, and in what manner it is put into the ground; in either case, whether broadcast, drilled or dibbled, it is necessary to keep it perfectly clean and free from weeds, which is essential to the crop, and future state of the land, and is accomplished either by the hand or horse hoe; but if sown broadcast it can only be effected by the hand hoe, but if drilled or dibbled the horse hoe can be used with great advantage; harrowing this crop in the early part of the spring, will frequently be found beneficial, particularly when the soil is hard and crusty on the top as it will have the effect of loosening the earth and enabling the plants to tiller out by giving them fresh strength and vigour. It is always necessary in the spring of the year particularly on light soils to apply the roller, this operation however should be performed with caution when the ground possesses a moderate degree of moisture, as its equal pressure will close the ground about the roots, and by that means cause new stems to rise, and prevent the wheat becoming root-fallen. On light soils, it is indispensably necessary to use the roller if the season will admit as it will frequently prevent the ravages of the slug and worm.

Top dressing where the land has been so wet as to prevent the carting out of the manure at a proper season, it will be found advantageous to apply top dressings of which there are various descriptions such as ground linseed, and rape cake, soot, coal ashes, dung and mould, lime and mould, and the like: the method of applying the former is either with the hand in the same manner as the corn is sown broadcast, or by spreading it out of the cart with a shovel, the latter is the most expeditious plan, if the land is not too wet to admit of the cart going on it; the quantity per acre is from twenty to forty bushels of soot, coal, or other ashes, fifteen bushels per acre of linseed or rape cake, and of the other manures according to the soil and its condition, the most usual time of putting on these dressings is in the months of Feburary or March.

Feeding off.—The feeding off wheat with sheep in the spring is by some considered beneficial when too forward, and has been found in many instances to be of great service, particularly when the plant has been growing up with a single stem, as by removing the upright or middle stalk the plant sprouts out and sends forth new shoots with greater strength than it would otherwise have done, if it had been exhausted by supporting the central stem. Feeding off answers best in light soils, but in that case it should be done as early as possible, or the crop may be so retarded by the check it receives as to become weak and spindly; on light sandy lands they should be first rolled, otherwise much injury may occur by the plants being eaten off, nor should the sheep be turned in on the wheat directly after a frost, as they would probably pull up a great proportion of the plants. Upon stiff and adhesive soils the feeding off wheat is better avoided, as it is frequently much injured by causing the straw to grow up weak and producing small ears and thin grain. But it is the opinion of many experienced farmers that the wheat seldom requires the sheep, if the sheep do not require the wheat; but if fed, March is generally the best month, and should be done quick. The practice of turning sheep on wheat sown on chalk soils has in some cases been of great service in checking the growth of the poppy when in a young state.

Harvesting.

Time of Harvest. Wheat is known to be ripe not only by the straw turning a yellowish color, but from the ears beginning to bend and the grain being found hard, but care should be taken to commence reaping as soon as the grain is sufficiently ripe, or great loss may be sustained by shedding, and the wheat will not be so good a sample.

The method of cutting is either by bagging or reaping, the former is performed by a hook, cutting the straw close to the ground, the latter with a sickle, leaving the stubble about

ten or twelve inches on the ground; bagging is much the neatest plan, and by which, all the straw is gathered, and saves the after expence of cutting and collecting the stubble.

Wheat-sheafs should never contain more than two or three handfuls, and should be placed in a slanting direction, with the heads of the sheafs, or ears together supporting each other, tied up with single bands only, as a security against a wet harvest, as by the employment of double bands, the wheat is frequently much injured by the quantity of wet lodging in them. We have seen an improvement in the management of sheafs of corn in harvesting, which appears to be well calculated to obviate the inconveniences of the wet season, The following description will give our readers a good idea of it. It consists of a stake six or seven feet in length proportioned to the height of the sheafs, and pointed at each end, being set in the ground six inches; by means of a sharp bar around this stake there are placed eight sheafs, a hood sheaf of double the size of the upright sheafs is bound tight near to the straw end of the sheafs, the upper part of the sheaf is then spread around the top of the upright sheafs. In this state the corn will remain without any extra expence, secure from injury by rain or wind, until it is in proper condition to be housed.

Stacks and Barns.

In the best cultivated counties, the use of large barns for holding corn, is disapproved of not only on account of the expence, but because the corn keeps better, and is less exposed to damage of any kind in well built stacks. Stacks are either built oblong, round or square, and sometimes on frames supported by stone, wood or bricks, encased with tin to prevent the access of vermin to the corn and to secure the bottom of the stack from damage. The tops should be thatched as soon as possible after they are made.

Thrashing.

Thrashing is performed either by the machine or flail. The common method of thrashing by flail is known by every one at all connected with agricultural pursuits, that a description would be needless. By thrashing with a machine great expense in labor is saved, and the work generally better performed, when made on a good principle, and enables the farmer to thrash a great quantity in a short time if required, without waiting the slow progress of the flail or leaving his barn exposed to various inroads. By the machine, however, the straw is much more broken than by the flail, consequently is not so valuable for marketable purposes.

Cleaning.

Winnowing or cleaning the corn by machine or flags are the most usual courses adopted; but a well constructed machine is by far the more eligible mode and takes out the smaller rubbish in a much more expeditious manner.

The produce of Wheat varies from twelve to forty bushels per acre, according to management, manure, preparation of soil and state of season; the average produce however of this crop throughout the whole Kingdom, is probably not more than two quarters and a half per acre.

Diseases.

1. *Mildew or Red Rust* * (*Uredo graminis.*) The lowest part of the stalks is always first affected, the most carefully prepared and finest seed sown in a soil which has not borne Wheat for years previously, are still open to infection. The Berberry tree is liable to the attacks of the same uredo, and wheat in the neighbourhood of that tree is liable to mildew, even to a proverb, yet the disease even here, always begin at the basis of the stalk. The uredo has been proved by experiment to propagate as well as live upon other substances than living organic substances. All these facts support the opinion that the disease is communicated from the soil. Again, what are the most effectual remedies? Land newly pared and burnt is never attacked by mildew. Salt applied to the soil at the rate of twenty bushels per acre, and well incorporated is equally effectual. If we may believe the testimonies of Mr. Sickler, Sir John Sinclair, Dr. Paris, &c. (See Johnson's Essay on Salt; Ed. 3rd. p. 50.), Salt is the most effective destroyer of all Fungi.

2. *The Smut,* (*Uredo segetum*) it appears upon the exterior, and effects the whole ear of corn. The smut-ball, or pepper-brand, (*Uredo fœtidas,*) grows within the grain of wheat. That these are conveyed with the seed, is a general opinion and experience seems to support it. Whatever may be the source from whence the disease proceeds, the seeds of the Fungi are evidently imbibed with the nutritive moisture by the roots of the plants and proceeding up the sap vessels, vegetate in that part of the plant which

* Under the diseases of plants (page 145) it is stated by mistake, that the fungi which constitute the diseases in wheat, are communicated to the plants from the soil. In a letter from Mr. Johnson, accompanying the above communication on the diseases of wheat, he wishes us to correct the statement alluded to; it ought to have been, "the fungus which constitutes the *mildew,* of wheat, I consider to be communicated from the soil; that which forms the *smut,* I incline to the opinion, is carried with the seed, though this is by no means certain."—Ed.

contains its appropriate food. That the seed may easily enter the orifices of the roots is certain for Mr. Bauer has observed that full grown plants, are only about 1-1200th. of of an inch in diameter.

3. *The Red Gum* is also a species of the fungus tribe. Its source is doubtful, but is most probably from the soil. Its vegetation depends however upon more varied contingencies than that of either the uredo graminis or the uredo segetum.

USE.

1. *The Grain* To enumerate the various uses of this valuable grain would be to dwell long on a subject that is generally known. Its principal application is as Pope says, for

" Bread, that decaying man, with strength supplies."

The Starch of the shops is generally procured from this grain, it is prepared by first steeping the grain in water, and then beating it in hempen bags. The mucilage by this means is mixed with the water, and after undergoing the acetous fermentation rendering the mucilage white, it is then set aside to precipitate, which being repeatedly washed is put into square moulds and kiln-dried.

2. *The straw.* The uses of wheat straw are various and well known. It is frequently cut into chaff and given to horses and neat cattle combined with other food. It is also extensively employed for litter, and sometimes for thatching. Besides the uses of straw above mentioned, it is employed for covering hay and corn stacks; twisted into ropes for various purposes: manufactured into paper; used in bottoming of chairs, stuffing horse collars, mattrasses and beds, packing china, glass and earthernware, and particularly in the manufacture of hats and bonnets, trinkets and various ornaments, by which numbers who might otherwise find it difficult to subsist, are furnished with the means of employment.

J. J.

WILLOW.

Willow (*Sâlix*) Diœcia Diándria Linn.; and Amentáceæ Juss.

The Willow constitutes a very numerous and difficult genus of trees. Many of the species are distinguished by such delicate shades, that only the most acute botanists can recognize them. Soil, situation and climate produce so considerable a change in their appearance, as to render it difficult to determine what are species and what varieties. Of those that attain a timber size, the following species are alone worthy of cultivation:—

1. The Huntingdon Willow, (*Salix Alba.*) This is the most valuable timber tree of the whole genus.
2. The Bedford Willow, (*Salix Russelliana.*)

The following species will succed in moist situations better than any other plant, and are therefore valuable on that account.

1. The common Osier. (*Salix Viminalis.*)
2. The eared Willow (*Salix Stipularis.*)
3. The Green Osier. (*Salix Rubra.*)
4. The Basket Willow (*Salix Forbyana.*)
5. The Triandrous Willow (*Salix Triandra.*)
6. The Velvet Osier (*Salix Molissima.*)
7. The Golden or Yellow Willow (*Salix Vitellina.*)
8. The Weeping Willow (*Salix Babylonica.*) This species is chiefly cultivated as an ornamental tree, for which purpose it is admirably adapted.

Culture, &c.

SOIL.

All the species succeed best in moist situations, the Huntingdon Willow, however forms an exception to this rule, as it prospers in situations that are perfectly dry and even elevated.

PROPAGATED.

By cuttings which root freely. Plantations of willows are usually formed in the following manner. Willows are generally planted by being pushed into the ground by the hand, which must be well defended by a piece of strong leather; but sometimes in pushing in the cutting, the bark is pressed off, in order to prevent this, it is better to use a

common dibble, shod with iron, and have them planted by it, like ordinary planting in the nursery. Where the ground is hard, or where there is a danger of pushing off the bark, they should be planted so as to leave five or six inches above ground, that when it may become necessary the top of the stools may be cut off, in order to renovate them. This may happen to be in ten or twelve years after planting, and the practice will be found of considerable advantage. It is a matter of indifference, whether cuttings be planted in a sloping or perpendicular position,

USE.

1. The golden willow being very tough and pliable, is extensively used by nurserymen for binding up packages of trees and shrubs, and for tying up the branches of walls and espalier trees. The other species are chiefly cultivated for basket work and hoops. The triandrous willow is most used for these purposes, whilst the Salix Forbyana seems best adapted for the finer sorts of basket work.

2. The bark of the huntingdon willow is used in tanning, for which purpose, it is considered but little inferior to the bark of the oak. A decoction of the bark forms a useful tonic, and may be safely administered in some cases of debility.

WINE MAKING.

1. Wine is the fermented juice of the grape. Liquors produced by the fermentation of artificial mixtures, composed of cane sugar, and the juice of the orange, gooseberry, &c. generally pass as wines. The only true wine, however, is that procured as first stated, since it is only in the grape that we find in the proper proportion all those substances necessary for its formation.

2. Chemists state that the following substances are to be found in the grape: vegetable fibre, a ferment or yeast, sugar in large quantity, potash, lime, the citric, malic, and tartaric acids, a small quantity of an essential oil, water, mucilage, and in some a red coloring matter. Of these the essential substances necessary to the production of wine, are sugar, vegetable extract or ferment, the tartarous, malic acid, and water. The different proportions in which these substances exist in the *must*, together with the mode of conducting its fermentation, constitute the essential difference between different sorts of wine.

3. The juice of the grape, when prepared for fermentation is called *must*, and as in the case of wort, the strength of the liquor will depend on the quantity of sugar it contains. Sugar is the substance on which all the others operate. We have already explained in the article Brewing, the change which the sugar undergoes during fermentation. It is unnecessary to go again over the same subject. The grape of this Country contains but a small quantity of sugar, and it is usual to supply the deficiency by the addition of cane sugar. The sugar of the grape is not wholly indicated by its sweetness. Some kinds possess more sugar and yield a stronger wine than others, which have greater sweetness to the taste. In the same way, treacle, which is the substance remaining after the sugar of the cane has been taken from it, possesses more sweetness to the palate than the refined sugar.

4. The vegetable extract or leaven is found in almost all vegetable substances. Little is known respecting its nature, its effects and phenomena are more readily explained. When the expressed juice of the grape is allowed to rest in a certain temperature, fermentation takes place. A substance is separated during the process and falls to the bottom of the vessel. The violence of the fermentation ceases, and will not again commence without a farther addition of this substance, either by stirring up what has been precipitated or adding a fresh portion. This substance appears to be the cause of fermentation, and which acting on the sugar produces a change into alchohol or spirit.

5. The vegetable acids which take a share in the process of fermentation, are the tartarous and malic. The apple, pear, and some other fruits, possess a large quantity of the malic acid, when this is abundant, we produce a liquor analogous to cider or perry, which differs essentially from the wine of the grape, one great cause of the superiority of the latter being the large proportion of tartarous acid it contains. By the action of the tartarous acid exerted on the compound of vegetable extract and sugar, the fermentation is rendered more perfect, and the vinous product is materially improved.

6. Such are the materials of that standard of perfection the grape, and in making an artificial mixture from our domestic fruits, we ought to bring together as nearly as possible the same ingredients in the same proportions. All our fruits are deficient in sugar, this must be supplied from the cane. Most of them have the malic acid in excess. None beside the unripe grape possess the tartarous acid in sufficient quantity. This must be supplied by the argol or unrefined red tartar of the shops. The vegetable extract can be supplied by all our fruits, and even by roots.

7. Of all our fruits the unripe grape appears to come nearest in its properties to the mixture wanted, it contains the tartarous acid and the vegetable leaven. Mr. M'Culloch (whose researches into the principles of wine making have furnished us in a great part with the preceeding observations) is of opinion, " that wines not to be distinguished from those of

foreign growth can be made from them at moderate expence, and that the success of the process is not at all affected by the uncertainty which attends the ripening of the grape in our climate. It is not too much to say that the use of this fruit is calculated to supersede the use of all others, and that its produce is almost the only species of domestic wine which is worthy of serious atention."

8. With regard to the proportions of sugar and fruit, Mr. Mc C. observes "the following general rule may be taken as a guide:—Two pounds of sugar added to a gallon of a compound containing all the other ingredients requisite to a perfect fermentation, produce a liquor equal in strength to the lightest class of Bordeaux white wines. Three pounds produce one equal in strength to the wine known by the name of white Hermitage, and from four, if fermented till dry, a wine resembling in strength the stronger Sicilian wines, that of Masala, for example, or the Cape of Madeira is produced, supposing these wines to be free of brandy. Where a fruit already contains sugar, it is obvious that the quantity of added sugar must be diminished in proportion to that which the natural juice may be estimated to contain if we are desirous of accurate results. If, in any case, wine is to be left sweet it is clear these rules are not necessary, less than four pounds cannot in such a case be depended on for producing that effect, and beyond that there is no limit but the taste of the operator."

9. As respects the quantity of fruit it is proper to notice that from economy too little is generally used. In the wine countries no water is used, but the whole fluid is composed of juice. In common practice the juice of the fruit rarely forms more than one fourth of the whole liquor and often much less; the proportion of fruit being seldom more than four pounds (including the solid matter it may contain) to eight pounds of water and three or four pounds of sugar. The consequences resulting from this sparing use of the fruit are important and often injurious. It is plain that the artificial *must*, thus compounded of water, sugar, and juice, must contain a much less quantity of the vegetable extractive matter and of the native acid than is essential to a perfect and efficient fermentation. To put the case in a stronger light, let this proportion of juice be still further gradually diminished, and the must will soon consist of little else than sugar and water, a compound incapable of forming wine. Let it on the contrary be increased, and a vigorous and perfect fermentation, with a produce perfectly vinous, will be the result.

10. The other fruits such as the elder-berry, currant, gooseberry, &c. require a liberal addition of the red tartar. This is the cream of tartar in an impure state. From a quarter to half a pound may be used to a cask of ten gallons. The sweetest fruit requires the largest quantity. It should also vary in proportion to the added sugar, increasing as that increases.

11. The leaves and the young shoots of the vine have been proved on chemical examination, to possess properties and contain substances exactly similar to the crude fruit. From vine leaves, water and sugar, wines have been produced, in no respect differing from the produce of the immature fruit, and consequently resembling wines of foreign make. The rules for the management are the same as those for the grape. The young or half grown leaves ought alone to be chosen, as may the green shoots and the tendrils. Generally speaking June is the time to pluck them. At least six pounds will be necessary for two of sugar. The leaves as they yield scarcely any thing to pressure, require to be infused for some time in water before they are submitted to fermentation. Tartar may be usefully added in the proportion of from three quarters to half a pound to ten gallons of the must.

12. According as the process of fermentation is carried on, the wine will be dry and strong, sweet, light and flavored, or brisk. The operator should determine what sort of wine he is desirous of producing, and regulate the fermentation accordingly. We have already seen that the vegetable leaven and the sugar, are the two substances by whose mutual action on each other the vinous spirit is produced. If certain proportions of these substances are taken, and the process of fermentation be allowed to proceed to its natural termination, the whole of the sugar will be decomposed, and a true vinous fluid will be the result. If the quantity of leaven compared with the sugar be under the standard requisite to produce this result, the produce will contain unchanged sugar. On the other hand, if the leaven has borne a disproportion to the sugar, or if the fermentation has been artifically protracted beyond its natural bounds, a new product will be formed, a portion of the spirit will disappear, and be replaced by acetous acid or vinegar.

13. From what has been said, it appears that sweet wine is but an imperfectly formed liquor, in which the leaven has borne so small a proportion to the sugar as to have been incapable of converting the whole into a vinous liquor. Such are commonly the mawkish compounds called domestic wines. If yeast of beer be added to the must in order to promote fermentation, a bad taste is invariably given to the wine. There exists not the least necessity for using yeast of beer provided the due proportions of fruit and sugar are preserved in making the must. 'How can we get rid of the sweetness?" is a question frequently asked by the makers of domestic wines, when their article is a subject of criticism." "It only wants keeping" say they. Our readers will see that it is not keeping but fermenting that is wanted, and that this process must be continued until the sugar is decomposed.

14. In order to produce the greatest effect with the quantity of leaven contained in the must, instead of allowing it to escape from the bung hole the yeast should be stirred into the liquor and mixed with the lees which have fallen to the bottom. By thus restoring the sepa-

rated leaven, fermentation may be prolonged at pleasure, until the wine has acquired any degree of dryness considered necessary.

15. If we wish to retain a considerable portion of sugar unchanged in the wine, in other words, if the wine is to be sweet, the obvious method is to separate the lees as completely as possible from the wine. This is effected by constantly keeping the barrel filled up, and allowing the yeast which rises to the top to run over, and not as in the former case to be again mixed with the liquor. In addition to this the wine is to be separated from that portion of the leaven which falls to the bottom by drawing it off into a clean cask.

16. The view of the subject that has been taken, by giving a knowledge of principles, affords us an opportunity of modifying our operations at any stage of the process, and renders the management as easy, as the compounding the ingredients on which we operate. We also learn that sweet wines of which the fermentation has been perfect, cannot turn sour because the leaven has been expended. But if this substance has not been exhausted or entirely separated by the various operations necessary, all wines will have a tendency to turn sour by a recommencement of their fermentation.

17. Neither racking nor clarifying are alone sufficient to free the wine entirely from the leaven. By drawing off or racking, we separate a considerable portion, by clarifying we precipitate or throw down another portion. Clarification is generally performed by isinglass, a small quantity of which is dissolved in some of the liquor and mixed with that in the cask. In a short time it collects at the bottom, carrying with it a portion of the leaven. A portion still remains in solution. In order to separate this a chemical process is necessary, to render the remaining portion of leaven inactive by producing certain changes on it. This is very easily done. Matches or pieces of linen are dipped in melted sulphur and introduced into the cask and suffered to burn within until they are extinguished by the consumption of atmospheric air. The wine is then put into the cask, and in a short time is racked off in the usual way. If the fermentation shew any sign of renewal, the sulphuring may be repeated.

18. The best mode of drawing off wine is by means of a copper or tin syphon with a stop cock inserted in the longest leg. The other leg should be thrust through a piece of cork, by means of which it may be kept at any height in the cask, and by turning the tap the liqeor can be prevented from running when it is no longer fine.

19. Coloring matter may be obtained in a variety of ways. The skin of the elderberry and the black varieties of grapes afford it by being fermented in the must for a few days before putting it into the cask. Every shade of yellow may be produced by burnt sugar. The rough astringent taste may be communicated by catechu or kino. The substances put into wines for the purposes of flavor, &c. should be introduced during the fermentation in the cask.

20. Mr. M'Culloch makes the following remarks on the addition of brandy to wines: " The addition of spirit so often recommended in the recipes for making fruit wines, so far from checking the wine from becoming sour, increases the tendency, and therefore the use of brandy as a preservative to wine is founded in error. This view is opposed to all popular opinions and practices, opinions most assuredly founded on erroneous and vague analogies, drawn from some supposed preservative power residing in spirit. It is the more particular in calling to this subject the attention of those who may engage in the manufacture of domestic wines, because a notion is prevalent, that these wines are above all others, deficient in durability, and cannot exist without this admixture. The effect on the contrary is to destroy the briskness of these wines, often the only meritorious quality they possess, while it encreases their expence and diminishes their salubrity. If taste or prejudice require that wine should be stronger than it can be made naturally, it may be done, but under certain restrictions. If added to the wine after it is completed, it merely produces a mixture in which the brandy is not only to be distinguished by an accurate palate, but in which all the evil effects are most conspicuous. To render the mixture more complete and less injurious, it should be made while the process of fermentation is still going on. The most convenient time will be during the insensible fermentation which takes place in the cask. By this method, a portion at least of the added spirit enters into permanent combination with the wine, in consequence of its having undergone the operation of the fermenting process, and the injury to the quality of the wine is the least possible.

21. It is almost useless to give numerous receipts after what we have already written. He who determines to regulate his fermenting process by mechanical rule will very frequently fail. As much depends on the after management as on the materials employed. Domestic Fabricators are too apt to fail in this particular, thinking that when they have mixed together a portion of sugar and fruit their labour is done, and that the rest of the process may be trusted to chance. They should on the contrary consider it but commenced. Many of our readers will expect definite rules, and we shall therefore add two or three receipts from which all the information may be derived that can be of any utility.

22. Wine from immature gooseberries. The fruit must be selected before it has shewn the least tendency to ripen, but about the time when it has nearly attained its full growth. The particular variety of gooseberry is perhaps indifferent, but it will be advisable to avoid the use of those which in their ripe state have the highest flavor. The green Bath is perhaps among the best. The smallest should be separated by a seive properly adapted to this pur-

pose, and any unsound or bruised fruit rejected, while the remains of the blossom and the fruit stalk should be removed by friction or other means. Forty pounds of such fruit are then to be introduced into a tub carefully cleaned,* and of the capacity of fifteen or twenty gallons, in which it is to be bruised in successive proportions, by a pressure sufficient to burst the berries without breaking the berries or materially compressing the skins. Four gallons of water are then to be poured into the vessel, and the contents are to be carefully stirred and squeezed in the hand until the whole of the juice and pulp are separated from the solid matters. The materials are then to remain at rest from six to twenty-four hours, when they are to be strained through a coarse bag by as much force as can conveniently be applied to them. One gallon of fresh water may be afterwards poured through the husks, for the purpose of removing any soluble matter which may have remained behind. Twenty-five or thirty pounds of white sugar are now to be dissolved in the juice thus procured, and the total bulk of the fluid made up with water to the amount of ten gallons and a half. Two quantities of sugar are named because the fruit itself varies in quality, and it depends on the operator to distinguish. Some receipts allow forty pounds; of which the consequence is invariably a sweet wine, while it fails in being brisk in nine of ten cases. The smallest quantity will most frequently ensure a brisk wine if the operator will but attend to the progress of the fermentation. The liquor thus obtained is the artificial must; which is equivalent to the juice of the grape. It is now to be introduced into a tub of sufficient capacity, over which a blanket or similar substance is to be thrown. The vessel being placed in a temperature varying from 55 to 60 deg. of Fahrenheit's thermometer. Here it may remain for twelve or twenty-four hours, according to the symptoms of fermentation which it may shew, and from this tub it is to be drawn off into the cask in which it is to ferment. When in the cask it must be filled nearly to the bung hole, that the scum which rises may be thrown out. As the fermentation proceeds and the bulk of the liquor in the cask diminishes, the superfluous portion of must, which was made for this express purpose, must be poured in, so as to keep the liquor still near the bung hole. When the fermentation becomes a little more languid, as may be known by a diminution of the hissing noise, the bung is to be driven in, and a hole bored by its side, into which a wooden peg is to be fitted. After a few days, this peg is to be loosened, that if any material quantity of air has been generated it may have vent. The same trial must be made after successive intervals, and when there appears no longer any danger of excessive expansion, the spile may be permanently tightened.

The wine thus made must remain over the winter in a cool cellar, as it is no longer necessary to provoke the fermenting process. If the operator is not inclined to bestow any further labour or expence on it, it may be examined in some clear and cold day towards the end of February or beginning of March, when if fine, as it will sometimes be, it may be bottled without further precautions.

To ensure its fineness, however, it is a better practice to decant it towards the end of December into a fresh cask, so as to clear it from its first lees. At this time also the operator will be able to determine whether it is not too sweet for his views. In this case, instead of decanting it, he will stir up the lees so as to renew the fermenting process, taking care also to increase the temperature at the same time. At whatever time the wine has been decanted, it is to be fined in the usual way with isinglass. Sometimes it is found expedient to decant it a second time into a fresh cask, and again to repeat the operation of fining. All these removals should be made in clear, dry, and if possible, cold weather. In any case it must be bottled during the month of March. The wine thus produced will generally be brisk, and similar in its qualities (flavor excepted) to the wines of Champagne, with the strength of the best sillery, if the larger proportions of sugar have have been used, but resembling the inferior kinds with the smaller allowance.

Inattention or circumstances which cannot always be controuled, will sometimes cause it to be sweet and still, at others to be dry.

In the former case, it may be manufactured the following season, by adding to it that proportion of juice from fresh fruit, which the operator's judgment may dictate, and renewing the fermentation and subsequent treatment as before. In the latter case, as its briskness can never be restored, it must be treated as a dry wine, by decanting into a sulphured cask, when it must be fined and bottled in the usual manner. Such dry wines are occasionally disagreeable to the taste in the first or second year, but are much improved by keeping, nor ought they to be drunk under five or six years.—(*M'Culloch.*)

RECEIPT FOR PARSNIP WINE.

Let six gallons be the proposed quantity; then clean thoroughly twenty-four pounds of the soundest roots; divide each root into four longitudinal pieces, and cut these long pieces across, so as to reduce them to little pieces of about three inches each. Put these, with about eight gallons of soft spring water, into a copper or iron boiler; cover the vessel closely, and bring the liquor to boiling; let it boil fully three hours, or till the parsnips become quite tender; try them occasionally, but be cautious not to bruise them; when this is ascertained, remove the fire and strain the liquor through a hair seive into a cask or

* The quantity is computed for a cask of ten gallons.

other open *wood* vessel, with like caution not to render it turbid by crushing the roots; add immediately three ounces of the best pale argol (crude tartar of wine) powdered, and stir it well twice or thrice in the course of half an hour; then add firm and good loaf sugar in the proportion of three pounds to each gallon of the wine to be made; i. e. eighteen pounds in this instance; stir till the sugar be dissolved; leave the cask uncovered till the liquor cool to 75 deg. of the thermometer. If it be kept in a place were the temperature is regularly at about 60] deg., it will probably ferment spontaneously; but be this as it may, barm or *yeast of beer* is utterly inadmissable, it spoils all home-made wines. A tasteless ferment or artificial leaven is readily obtained by boiling two ounces of wheat flour or potatoe starch, one ounce of moist sugar, and about half a quarter of an ounce of salt, in a pint and a half of soft water, till reduced to a pint, stirring the mixture continually; then remove it from the fire, and when cool, bottle and cork it up, and place the bottle in the hearth or other situation, where it may be kept gently warm; it will ferment in twenty-four hours. If there be lees of a previous parcel of wine perfectly fresh and sweet, they will furnish the most natural ferment; but if otherwise, a tea-cup full of the mixture (which should be previously prepared) may at first be added, when the liquor is at the heat mentioned above; now cover the cask first with a flannel cloth and then with the loose head of the cask upon the cloth; stir the liquor twice a day, and if it do not ferment in twenty-four hours, add another cup full of the leaven. In three or four days tun the wine into a *sweet* and *dry* six-gallon cask. If the intention be to make a *sweet* or *rich wine*, fill the cask quite up to the bung, and let it work over, and be filled up with liquor reserved for the purpose; this will throw off the froth or product of fermentation; and as soon as the chief hissing ceases, bung the cask close and cover the bung with a mass of moist sand, leaving, however, a vent hole with a peg closely in it to prevent accident, but close it as soon as possible. If, on the contrary, a *dry wine* be desired, leave about two inches space in the barrel, cover the bung hole with a tile, and stir in the froth that rises and rouse up that which settles, so as to retain and disseminate the fermenting principle, and thus to laborate the sugar as much as possible; close the cask tightly in about ten days, and shake or roll it well once or twice a week for a month. Whenever the wine becomes dry, rack off the clear into a clean and sulphured cask, (that is, one which is filled with the fumes of burning sulphur.) The lees may be preserved in a glass stopped bottle, in a cool place for a future brewing. March is the month for making parsnip wine: the wine may be racked in clear weather about the end of the following December. In March following it should be fined with a quarter of an ounce of isinglass dissolved in a pint of the wine, poured into a cask, and stirred round; when it has settled and become bright, rack it again: it will be better to keep it till Christmas following in wood—but it *may* be bottled as soon as bright after fining. Bear in mind most particularly, that fining, racking, and bottling, must ever be performed in cool, still, and serene weather; all atmospheric commotions are caused by agencies which instantly affect fermented liquors very perceptibly. These directions will in general apply to all home-made wines, but wines from *fruits* require no artificial ferment or leaven, though they imperatively require to have three times the quantity of pure juice of fruit that is usually allowed, and also of the addition of the argol or crude tartar; this appears to be of essential utility to all home-made wines, it gives a quality which approaches to that of a foreign wine, and aids the vinous fermentation.

RAISIN WINE.

The following is from the Transactions of the Society of Arts Adelphi, by Authur Aikin, Esq. F.L.S., F.G.S., &c.

"I have for some years been in the habit of making for use in my own family, a light dry raisin wine. I have also noted down, with more or less minuteness, the progress and result of several of these experiments; and I beg leave now to offer them to the society, in the hope that thereby some additional light may be thrown on a very important branch of domestic economy.

It appeared to me from some previous comparative trials with black currants, and with others of our native fruits, that none of them are so well adapted to make light dry wines as the better kinds of raisins; a further advantage attends the use of this latter fruit, that the wine may be made at the season when the temperature is most favorable to the due progress of fermentation.

The raisin which I have been most in the habit of using, and which I prefer, is the Muscatel. It is imported in boxes, containing about twenty pounds; and when new is in common use as a table fruit. In this state it would doubtless make a wine of excellent quality, but its price prohibits its employment for this purpose. In those which remain unsold for about a year, the rich pulp of the recent raisin becomes mixed with sugary concretions, which render it less acceptable at the dessert; and the price of such fruit being from tenpence to a shilling per pound, brings it within the reach of the domestic wine-maker.

That matter, whatever it be, which through the process of fermentation, converts a solution of sugar into vinous liquor, exists in raisins in sufficient abundance to change into wine a greater quantity of sugar than the wine itself contains; and I have found it advantageous, both as regards the price and quality of the product, to add to any given quantity of raisins from one-tenth to one-third of their weight of sugar. In order, however, to avoid tainting the wine with the peculiar flavor of cane sugar, I use good loaf at the average price of tenpence or eleven-pence a pound.

In my early experiments I poured hot water on the raisins, and allowed them to remain therein twelve hours, more or less; by this time the raisins were plumped up, and I pressed them between fluted wooden rollers in order to break their skins and press out the juice. This process however by no means succeeded to my wish; the rollers were clogged and stained by the fruit which adhered to them, and many of them by reason of the toughness of their skins passed through the rollers entire. I therefore adopted the plan of having the raisins chopped (without previous maceration) on the same kind of tray and with the same kind of chopper as is used in making minced meat; and I have had no reason to vary from that method, except that of late, I have directed the raisins to be chopped finer than they were at first. Previous to the raisins being chopped, the stalks are separated for a use that will be mentioned hereafter.

I have tried several proportions of ingredients, but those from which I have obtained the best results are, three pounds of raisins, and one pound of sugar, to an ale gallon of water.

I prepare the must, sometimes by mashing, sometimes by maceration.

The mashing is performed in the following manner: the chopped raisins being put into an open tub, or in an earthenware pan, I pour on these hot water, in the proportion of about a quart to four pounds of fruit. My object, in this first mash, is to extract the greater part of the saccharine mucilage as little altered as possible; I therefore heat the water no higher than about one hundred and twenty degrees of Farenheit's thermometer; the water and fruit are mixed, and after standing for about a quarter of an hour, the whole is stirred together as accurately as possible, by hand, taking care to break down all the lumps, and in a few minutes afterwards is placed on a seive over a tub where it drains for a short time, the husks are then lightly pressed by the hand, and are returned to the mash tub.

The second mash is made exactly in the same manner as the first; and the husks, after pressing, are returned again to the mash tub.

They will now be found to have lost the whole of their clamminess, though they are still sweet; I therefore conclude that the saccharine mucilage is now for the most part extracted, and my principal object in the subsequent mashes is to dissolve out the tartar. For this purpose the water of the third mash is put on at the heat of one hundred and fifty or one hundred and sixty deg. and is conducted in the same manner as the former. The liquor thus obtained is considerably acidulous, having the flavor of the raisins and but little sweetness. Three-fourths of the mash being now made, it is tasted, in order to astertain whether it is sufficiently astringent, and according to the intended astringency of the wine, I either altogether reject the stalks, or use the whole or a part of them. If a somewhat astringent wine is intended, the last mash is thus prepared: I pour boiling water on the stalks, in a separate tub, and after they have been macerated for about a quarter of an hour, I put the liquor on the husks, and mix them well with it; in a quarter of an hour more, the liquor is put in the seive, and the husks are well squeezed by the hand.

While the last mash is preparing, I transfer the liquor of the first three mashes into the fermenting tun and dissolve the sugar in it; I then add as much of the last mash as is requisite to bring the must to the due proportions, viz. one gallon of must to three pounds of fruit and one pound of sugar. The time occupied by the above processes is four or five hours, and the temperature of the must, when put into the fermenting tun, is usually about seventy degrees.

If the weather is warm and apparently more likely to become hotter than colder, I pour the must into the fermenting tun with as little agitation as possible: but if it is cool, and not likely to get warm, I dash each handful against the sides of the tun, pouring it in from as great a height as I can conveniently reach; by this means it is more mixed with atmospheric air, and the liquor thus treated will often begin to ferment in less than twelve hours. If the must is at the temperature of seventy degrees, fermentation begins in from twelve to to thirty-six hours, according as it is heated; and the scum which rises is sometimes taken off every day, and sometimes allowed to remain till the liquor is about to be removed from the fermenting tun. If the fermentation is languid, I keep on the cover of the tun and stir the scum daily into the liquor; if too rapid, I take off the cover and remove the scum as it rises.

The lowest temperature at which I have known fermentation to take place, is forty-eight degrees. On this occasion the must was forty-eight degrees when it was put into the tun, the temperature of the cellar being forty-six degrees. On the next morning it was at forty seven degrees, and on the second morning at forty-six degrees, the temperature of the cellar remaining the same; on the third morning both the liquor and cellar were at forty-five degrees, no signs of fermentation having yet appeared. The liquor was then placed before a fire for some hours, and the fermentation began; it was then removed to the cellar, and on the fourth day the fermentation was going on steadily, but slowly, at forty-eight degrees. I have never made wine when the heat of the air was above seventy degrees, and on the whole I prefer a temperature of from fifty-five to sixty degrees. That of the liquor after the second day continues about two degrees above that of the cellar, till the eighth or ninth day, when the fermentation has usually become languid, and the heat of the liquor and of the cellar scarcely differ more than one degree

The liquor is now vinous but sweet, and after carefully skimming it, I transfer it to glass carboys, containing about six or seven gallons, or to stoneware barrels of the same size

I insert in the bungs glass tubes of safety, and on the second day pour into these about an inch of quicksilver to exclude the air. The cement that I use for covering the bungs is a mixture of wax and resin.

Carbonic acid continues to bubble through the quicksilver in the safety tube for some weeks, after which it ceases; but the volume of quicksilver in the exterior leg of the syphon is always higher than that in the interior leg, I have never seen a single instance of the outer air passing into the carboy.

The loss during the fermentation in the tun is about six per cent., subject, however, to variations from the temperature of the liquor, from the scum being removed once or oftener, and from the cover of the tun being left on or off.

I think the wine ought to remain an entire summer in the barrel or carboy, in order that the fermentation may proceed so far as almost entirely to decompose the sugar; and as my usual times of wine making are April and October, that made in the former month is bottled in the March following; and that made in October is bottled about the end of September, or a week or two later, according to circumstances.

I never fine the wine, being of opinion that the light dry wine, which it is my aim to produce, would be materially injured by being deprived of its tunning through the action of isinglass, or of any similar substance.

At the time of bottling I have seldom observed the wine to have any very sensible flavor,—meaning by flavor, that compound sensation of smell and taste which characterises the finer kinds of wines; but after remaining a year in bottle, a flavor resembling elder flowers is strongly developed, mingled generally in a slight degree with that of prussic acid.

As soon as the wine begins to run turbid from the carboy, I pass the whole of what remains through a filter; but though I am careful that the wine when bottled should be clear, though not bright, there is always more or less of flocculent matter deposited, which requires the bottles to be set upright in the bin, and to be decantered with care.

The wine when first decanted is often of a very pale yellow color, especially if high flavored; but in an hour or two it deepens more or less, and at length acquires a tint like that of Bucellas, the prussic acid flavor at the same time disappearing.

Instead of mashing as above described, I have sometimes pursued a still more simple way, that of maceration, by mixing in the fermenting tun the usual proportions of chopped raisins and sugar with cold water, and leaving the raisins in the liquor during the whole of the first fermentation. By this method I obtain a higher-colored wine, but the fermentation being generally slower and consequently larger, it is destitute of that Frontignac or elder-flower flavor which it generally acquires when treated according to the first process, and is apt to get a less agreeable flavor from the husks of the raisins. Sometimes however the method succeeds very well, and the elder-flower flavor not being pleasant to many persons, such wine is more generally acceptable than the former.

In May, 1827, I made some wine in the way last described. The materials were put together on the third day of the month, the temperature of the liquor and of the cellar being fifty-six degrees. On the fifth, at night, fermentation had just began, the temperature of the liquor and cellar was fifty-six degrees. On the seventh the liquor was at fifty-eight degrees. From that time to the nineteenth the fermentation went on, though languidly, the temperature of the liquor varying from fifty-seven to fifty-eight and a half degrees, and that of the cellar from fifty-five to fifty-seven degrees. From the 19th to the 24th the weather became warm, the temperature of the cellar rose to fifty-nine degrees and that of the liquor to sixty-one degrees. It had now been twenty-one days under fermentation, and therefore though it was still rather too sweet, I put it into carboys, and bottled it about half a year afterwards. This wine is now (December, 1828) strong, dark-colored for white wine, but still rather sweet, and tastes too much of the husks."

YEW.

Yew (*Táxus Baccáta*), Diœcia Monódelphia. Linn.; and Coniferæ, Juss.

The yew is a native of many parts of England and Scotland. It is an highly ornamental as well as useful tree, and should be found in every park and lawn were any thing like decorative planting is attempted, no tree carrying with it so picturesque an appearance as an aged yew.

Culture, &c.

SOIL.

The yew appears to grow equally well upon all kinds of soil, shallow or deep, dry or wet, but principally upon those of a chalky nature.

PROPAGATED.

1. *By Seed*, which ought to be gathered as sown as ripe, which is generally in October, and either sown immediately without clearing them from the pulp, or mixed with sand and laid in a heap to be turned over two or three times during the winter, and in spring the seed from which the pulp will have rotted, sown in beds of a light loamy soil, and in either case allowed to remain in the seed bed for two years before they are planted out into nursery lines.

2. *By cuttings or layers.*—Cuttings of the young wood will generally root freely, and having once taken root they should be planted out into nursery lines to attain sufficient size, age, and strength, for final planting.

PLANT.

Yews will succeed although planted of a large size, which is usually done when ornament is the object; but when extensive plantations are intended, plants from eighteen inches to two feet high will always succeed best.

USE.

1. It is but seldom that this tree is planted to any considerable extent with a view to attain a timber size; but although a slow growing tree, circumstances may warrant in favorable situations, extensive plantations to be made, as the timber is valuable when of a large size, and of great durability. Gate posts and flood-gates are sometimes made from the wood, and is said never to rot. Being of a fine grain and capable of receiving a very high polish, it is sometimes used for various articles of furniture. It is also particularly useful for making ox-bows, and it is said that bows formerly used by warriors in this country were made of this wood. In this way the yew has proved fatal to three of our kings. Harold was killed by an arrow at the battle of Hastings, in Sussex; William the Second was slain by an arrow in the New Forest, Hampshire; and Richard Cœur de Lion received his death from the same weapon, at the siege of the castle of Chalus, in France.

2. As the yew can be clipt and bent into almost every form, it is frequently used for making hedges, forming a screen through which no wind can find its way. There is a hedge of this sort at the Earl of Egremont's, at Petworth, in Sussex, which presents a very pleasing appearance, its top and edges have been always kept neatly and regularly clipt.

The yew is poisonous both to man and cattle; farmers and others should be careful of the clippings of hedges and trees being thrown where sheep and cattle feed in snowy weather. More horses are destroyed by the leaves of the yew than by any other vegetable poison. A sleepiness from which the animal can scarcely be roused, steals over him, and he dies without any symptom of pain. According to Mr. Youatt, ten grains of the croton nut should be given to the horse as soon as the poisoning is suspected; he should be drenched with equal parts of vinegar and thin gruel, and the croton repeated in six hours if it has not previously operated.

3. " No plant," says Sang, " is better adapted for underwood than yew, it will thrive under the drip of other trees equally with the holly. As the cypress in the east, the yew in Britain has been appropriated to the decoration of sacred ground from time immemorial; it is therefore a fit accompaniment to the temple and mausoleum." Such appear to have been the ideas of our forefathers, and hence we find these trees in church-yards and near places of worship, attaining a vast size and often in considerable numbers, even in parts of the country where it is almost otherwise unknown.

This circumstance has often been noticed but never satisfactorily accounted for, some asserting that the branches of this tree used on palm sunday and other days, for the decoration of churches, gave it a place near at hand, while others with less probability of truth, suppose the yew to have been planted near churches to afford materials for cross-bows should the congregation be surprised by an enemy. The dark foliage of the yew tree seems well calculated to give a solemnity to the village church-yard, and its wide extending branches offer their shade to the rustic Sunday politicians, until the treble bell announces the time of prayer.

According to Ray, our ancestors planted the yew in church-yards because it was an evergreen, as a symbol of that immortality which they hoped and expected for the person there deposited :—

" Beneath those rugged elms, that yew-tree's shade,
Where heaves the turf in many a mouldering heap,
Each in his narrow cell for ever laid,
The rude forefathers of the hamlet sleep."—GRAY.

APPENDIX.

APPENDIX.

CHAPTER I.

ON SUSPENDED ANIMATION. By WILLIAM KING, M.D.

Life being the most valuable possession of man, there is an instinctive desire for its continuance, and an instinctive horror at the approach of death. The natural termination of life can be avoided by no one; but there are many instances in which death is only apparent and not real; in which, indeed, the spontaneous return of life and animation to the body is impossible, but in which that return may be brought about by art, by the use of proper means, properly applied, and patiently persevered in; by the use of that knowledge which has been accumulated by medical men, and which might be familiar to all, if they would impose upon themselves the duty of acquiring it. We propose to give some account of the circumstances under which apparent death takes place, and of the means which are most likely to be successful in restoring the unfortunate sufferer.

Circulation of the Blood.

In order to render the subject more intelligible, we shall explain one of the principal effects of life, as the cause and cure of suspended animation cannot be understood without it; this is the circulation of the blood.

Though the human body appears to the spectator so still and calm within, yet if the finger be placed upon a particular part of the wrist, a pulsation will be felt; if the hand be placed upon the left side of the chest, a stronger pulsation will be felt; and if the white part of the eye be looked at steadily for a short time, small streaks of red will appear and disappear upon the surface, more particularly will this be the case when a person has taken cold.

These circumstances all arise from the same cause; viz., the circulation of the blood. The blood is continually flowing round and round the body. It begins as it were at the chest, where, on the left side, is the heart. This acts like a double pump, continually sucking in the blood on one side, and forcing it out on the other. The structure of the heart is of flesh, which is called by anatomists, muscle. This has a natural power, independent of the will, of contracting and relaxing itself. When it relaxes it sucks in the blood from the right side; when it contracts it forces it out on the left side. From this left side proceeds a large tube or pipe called by anatomists a blood-vessel or artery. This artery becomes smaller as it goes further from the heart, and continually sends off smaller tubes or arteries, which also divide again into still smaller ones, till they reach to every part of the body, within and without. Though the arteries are continually growing smaller, yet they increase so greatly in number, that they hold a much greater quantity of blood than the large artery which comes immediately from the heart.

The arteries are so formed that they also have a contractile power, and great elasticity, so that when the blood is thrown into them by the heart, they are expanded by the stroke, but they immediately contract upon the blood, and assist in forcing it over the body.

When the arteries reach the end of their course, at the surface of the body, or in the inner parts, they become so small as to be invisible, not only to the naked eye, but even when it is assisted by the microscope. They are then called capillary vessels, from the Latin word *capillus*, a hair. At these points, all over the body, the blood is converted, by the specific power of the arteries, into the substance of which the part consists, or into some fluid peculiar to the part, called by anatomists a secretion.

Besides this, the artery itself undergoes a complete change into another kind of tube or vessel, called a vein. The small veins, called also capillaries, soon unite into larger veins, and these again into larger ones, till all terminate in one large vein going to the right side of the heart, just as one large artery went from the left side of the heart.

The veins are not elastic like the arteries, but they are very strong.

As soon as the blood reaches the veins its motion is changed from a very rapid to a very slow one. It moves with such velocity when it leaves the heart, that the beating of the arteries, which is called the pulse, is felt at the same instant all over the body. As soon as it reaches the veins the current is slow, but uniform. The veins have no pulse: they contain, however, a contrivance which does not belong to the arteries. To insure the regular progress of the blood, and to prevent its pressing backwards and impeding the

entrance of the blood from the arteries into the veins, valves are placed along the course of the vein, which permit the blood to pass on freely, but are easily closed when the fluid has a tendency to move backwards.

Thus the blood is set in motion by the force of the heart, which throws it at once into the veins; and it is kept in motion by each successive current urging on the preceding one, while the valves prevent its returning, even if it had any tendency to do so. By this contrivance also, when any pressure is made on the veins, as happens in every movement of the body, the valves compel the blood to move in one direction.

Another change, most important to our present purpose, takes place when the blood passes from the arteries to the veins. When it leaves the heart it is of a florid-red colour; when it enters the veins it becomes immediately of a black colour, or a very dark-red. The precise cause of this change is unknown; but the change of colour is accompanied by a corresponding change in quality. Arterial, or red blood is necessary for all the purposes of life; every part of the body is made out of this; every secretion is made from it. The brain and nerves receive their stimulus from this, and without it could not perform their functions in the body. On the contrary, venous or black blood is destructive to life: if it were to circulate in the arteries, no secretion could be made from it, and when it reached the brain it would act like poison upon it, and destroy life.

Therefore, as the blood is continually circulating round the body, going from the heart to all parts of the body by the arteries, and returning from the body to the heart by the veins; and as it changes its colour from florid-red to black on reaching the veins, and black blood circulating in the arteries is destructive of life, it follows that the colour must undergo another change—from black to red, before it is fit to enter the arteries again. This change takes place in the lungs. The heart is so contrived that the blood cannot get from one side of it to the other without passing through the lungs. In doing this, the colour is changed from black to red. This is effected by the action of the air. The membrane which lines the lungs is extremely thin and delicate; it is also of such a texture as to allow the air to act through it upon the blood as it circulates. The black matter is removed from the blood by this action, and the blood becomes of a florid-red. The lungs consist of an arrangement of arteries and veins similar to that of the body. One large artery goes from the right side of the heart to the lungs, which divides and subdivides into an infinity of smaller ones; these at last become small capillaries similar to those in the body. In these capillaries the blood changes colour, then it enters the veins of the lungs, which gradually unite into a few large ones, which carry the red blood to the left side of the heart, by which it is thrown round the body.

It is the change of the colour of the blood in the lungs which is so important, in order to understand the cause of suspended animation. If, by any circumstance whatever, the air be prevented from entering the lungs, the colour of the blood cannot be changed as it passes through the lungs; and the black blood flowing to the left side of the heart, and being thrown into the body, causes death. The change of colour is supposed to arise from the removal of charcoal from theb lood, called by chemists carbon, by its combination with a portion of the air called oxygen. thus forming a gas called carbonic acid. Though this gas, which is invisible to the eye, may appear of trifling consequence, it is not so in reality, for it carries off about three-quarters of a pint of pure carbon in twenty-four hours.

Some persons suppose that the black blood is dangerous as soon as it enters the veins of the lungs, and before it reaches the heart and is thrown over the body. They imagine that it produces a spasmodic contraction of the veins of the lungs, which soon puts a stop to the circulation. If this be true, no blood, or at least very little, will be sent by the heart to the brain and the body; and the want of this is followed by the same bad consequences as the transmission of black blood. Whether the brain be left void of blood, or be filled with black blood, life is soon extinct. Upon these principles let us consider the nature of suspended animation.

Suspended Animation by Drowning.

When a person remains under water the air cannot be drawn into the lungs. The air that is in the lungs will perform its office for a short time, in changing the colour of the blood. As soon as this change is completed, the supply of air not being renewed, the black blood endeavours to flow into the veins of the lungs, and the consequences before stated take place. The brain, receiving either no stimulus or a poisonous one, loses its power over the rest of the system. The brain, in its healthy state, has a power over the action of the heart. There is a strong sympathy between the two organs; the brain is affected by the emotions of the mind; the heart sympathizes with this affection. When the brain is diseased the heart sympathizes again. So, when the brain is affected by the absence of blood, or by the presence of black blood, the heart loses its active powers. It gradually beats more slowly and feebly, and at length ceases entirely. When the heart has ceased to beat, another effect begins to take place. The body begins to lose its heat. During life the heat of the body is considerably above that of the air; the degree of heat is very uniform, under all circumstances, whether of rest or exercise, of cold or hot air. The heat of the surface of the body may vary, and particularly the sensation of heat varies considerably; but the actual heat, measured by a thermometer, held in the mouth for a few minutes, varies but

little. As soon, however, as life is extinct, the heat begins to diminish, and continues to do so till the body becomes of the same temperature as the air or the water with which it is surrounded.

When, therefore, a body has been under water some time, two things are to be done; the first, to restore the heat, the second, the action of the heart.

We must here notice a popular error which has led to very improper means for recovering drowned persons. It was formerly generally supposed, and is so still by many persons, that in the act of drowning, a large quantity of water enters the lungs and the stomach, which ought to be dislodged before there is any chance of recovery. The only method of doing this seemed to be to shake the water out of the body as we should do out of a bottle with a narrow mouth. The poor sufferer, therefore, was to be very roughly used, and shaken in various positions, till this supposed water was supposedly expelled. It is possible that a mouthful of water may be swallowed in the first fright and effort at relief, but it is not possible for water to penetrate into the lungs. A spasmodic action takes place at the top of the windpipe, by which it becomes closed, occasioned by the irritation of the water: the air contained in the lungs is locked in, and the entrance of water is prevented.

No rough usage, therefore, need be made use of; but the body should be carefully carried upon a frame or board to a bed, with as little delay as possible. Then it should be cleaned, and wiped perfectly dry, and the first great point to attend to is to restore warmth. The body should be placed between blankets; large stone bottles of hot water should be placed round it, or large bags filled with hot bran, or corn of any kind, or chaff or sawdust; and, if possible, warm air should be admitted under the bed-clothes.

A very simple contrivance for this purpose is used in some hospitals, by which a patient may be placed, as it were, in a hot-air stove, and profuse perspiration be produced. A light frame or cradle is placed over the body, so as to leave a space between the body and the bed-clothes. The clothes are brought close round the neck of the patient. At the bottom of the bed, the frame has a tube about three inches in diameter, ending in a funnel-shaped mouth. Under this is placed a large lamp of the Argand kind. The hot air from the lamp ascends through the tube and fills the frame, and heats the body and the bed. This hot air cannot injure the body, at whatever heat it may be applied, and may be made much hotter than the water bottles, or the bags, without inconvenience. If such an apparatus can be obtained, it is the most perfect that can be used for restoring heat to a body after drowning. As soon as all these means in our power are resorted to for restoring heat, and while they are going on, the body should be rubbed with the hands of several persons, as far as they can do it without uncovering the body. They may use, in addition, hot brandy. Every part should be attended to, but more particularly the chest, especially on the left side. Here the warmth and friction should be more steadily and perseveringly applied, in order to excite the action of the heart.

After these means have been continued a certain time, about half-a-pint of warm brandy and water, of a moderate strength, with about a tea-spoonful of spirit of hartshorn, should be injected into the stomach by means of a stomach-pump. While life continues suspended, the pipe may remain in the stomach, so that the fluid may be withdrawn, if thought proper, to judge of its temperature, and replaced by fresh fluid. This will increase the chance of restoring warmth, internally as well as externally.

An injection of the same kind, one or two pints, should also be thrown into the lower bowels by means of a syringe, or of the common bladder and pipe, if the syringe is not at hand.

These means must be persevered in for many hours, for it is impossible to say when the possibility of restoring animation ceases. No relaxation of exertion should take place for at least twelve hours.

When these means have all been arranged, and are going on, an attempt should be made to inflate the lungs. For this purpose, a pair of bellows has been contrived, with a double valve, so as to force the air into the lungs, and to draw it out again immediately. But as few persons possess such an apparatus, a pair of common bellows must be used. To do this, three persons are necessary: one must use the bellows, applying them to one nostril; the second person must close the other nostril and the mouth; and the third must press gently upon the chest, when the inflation has been made, in order to force the air out.

The third means to be used, is, if possible, to apply electricity or galvanism to the chest, so as to stimulate the heart to act. The human body is very susceptible to the action of this principle; and a muscle may be made to contract many hours after death, when stimulated by it. As this principle is not likely to be applied unless a medical man be present, it is unnecessary to enlarge upon the proper mode of application.

Suspended Animation by Hanging.

Life is also destroyed by hanging. In this case, a tight ligature being placed round the neck, the entrance of air into the lungs is prevented, the change in the blood does not take place, the circulation ceases, and life becomes extinct. In this case, the heat of the body does not so quickly diminish as in drowning. Therefore, if the body be discovered before the heat is reduced to a level with that of the atmosphere, less effort is required to

raise it to its natural standard. The body, as before, must be carefully removed to a bed; warmth must be supplied in the same manner; the same frictions, with hot brandy, must be used; the same injections into the stomach and bowels; the same method of inflating the lungs; and the same electrical or galvanic means.

In addition to this, after a short time, the jugular vein should be opened, to attempt to draw blood from the head; for when death is occasioned by hanging, the head is always found preternaturally loaded with blood. This is of itself sufficient to derange the actions of the brain and nerves, and, through them, of the heart.

It was formerly supposed, that in the act of hanging, the bones of the neck were dislocated, and that death was occasioned partly by pressure upon the spinal cord. If this were the case, no attempts to recover the patient could be successful; but this is an effect which happens very rarely,—not above once in a hundred times, when criminals are executed. The sole cause of death is the stoppage of the circulation, and all the means of relief should be directed to restore this.

Suspended Animation by Choaking.

Another circumstance which may occasion suspended animation, is the introduction of some solid body into the throat, so as to prevent respiration, or which may by its presence occasion spasm of the upper part of the windpipe, and produce the same effect. Sometimes a small body has been known to enter the windpipe, in spite of the irritability and quickness of the muscles. When this is the case, it may produce death in a few moments. Some cases, however, have occurred in which death has not followed so soon, and the foreign body has been removed. Whether the body be lodged in the throat, or in the windpipe, it is necessary to remove it. In the former case it may sometimes be possible for an unprofessional person to do it: in the latter none but a skilful surgeon can do it. An opening must be made in the front of the windpipe for that purpose; and such an operation has often succeeded.

Suffocation.—Sometimes the throat gets so swelled from cold and inflammation that the breathing is impeded in a dangerous manner. In such cases it is possible to save life by the same means, viz. by opening a passage for the breath in the front of the windpipe.

Suffocation may also arise from close places and foul air. If a man descend into a well, or a vault, or a large brewers' vat, he may be enveloped in air which is unfit for supporting life. The effect upon the lungs will then be just the same as if the breathing were forcibly stopped by drowning or hanging. The proper change in the blood will not take place, the circulation will stop, and death will follow.

The way to ascertain whether any suspected place be fit to enter, is to place in it a lighted candle. The same air which is necessary for life is necessary for light, and what extinguishes the one extinguishes the other. If the candle continues to burn bright, there is no danger in breathing the air. If the candle be put out, it would be fatal for a person to enter.

If a person has been exposed to such an air, and be brought out insensible, the same means of recovery must be used as before.

Suffocation may also be occasioned by the smoke and confined air occasioned by fire. The same means of recovery must be resorted to. When a person is exposed to this danger, they should always lie down on the ground, and keep the mouth as near the floor as possible, while they make their escape, as the freshest and purest air is always at the lowest part of the room. A fire also produces the same foul air as is found in brewers' vats, which, being driven upwards by the heat of the fire, fills the whole room. A charcoal fire produces the same deadly gas or air, and many persons have been killed by allowing a small pan of charcoal to burn in their room in order to warm it.

Fainting.—The act of fainting is familiar to most persons. This is one form of suspended animation which generally lasts but a short time. Fainting is produced either by the loss of blood from the arm or from some other part of the body, or from a violent concussion of the body from a severe blow or fall, or from some effect upon the mind—of terror or even surprise. When fainting is occasioned by loss of blood, it may become very serious, according to the extent of the loss; and every means of rousing the action of the heart must be resorted to. The temples and face should be rubbed with brandy or spirit of hartshorn, the nostrils should be slightly touched with them, and, if possible, small quantities should be conveyed into the stomach. When a violent blow has been received, the case generally requires medical aid, and the consequences are so serious that this aid should be obtained as speedily as possible. When the fainting is occasioned by mental emotions, the patient always recovers spontaneously, but it is nevertheless desirable to hasten it by using stimulants.

Cold.—Persons are liable to endanger life by exposure to intense cold. Sometimes the limbs get frozen, but this does not fall within our present purpose to treat of. Long exposure to cold produces drowsiness and stupidity of mind, which may increase till life is destroyed. If a person falls asleep under such circumstances, he is likely to perish. If discovered before life is extinct, he must be treated nearly in the same manner as in endeavouring to recover people after drowning. He must be placed in a moderately warm bed, between blankets; the warmth of the body must be gradually (not suddenly) raised

by warm applications, but principally by warm frictions; the spirit of hartshorn or brandy should be rubbed on the temples, chest, hands, and feet; and warm weak brandy and water, or warm coffee, with a small quantity of brandy, must be injected into the stomach. The heat of the body must not be raised too hastily, nor must the body be brought near a fire.

Intoxication.—Another form of suspended animation may be occasioned by intoxication. When stimulating liquors are taken into the stomach by slow degrees, a person becomes intoxicated gradually, and gradually recovers from it without assistance; but when large quantities of spirit are drank in a short space of time, the sudden effect upon the body is exceedingly dangerous. The vital powers are overwhelmed and oppressed instead of being excited, and, without proper assistance, life is liable to be extinguished. The action of the heart is depressed, the pulse becomes slow and weak, and the extremities and skin become cold. The power of the nervous system is equally diminished, and the whole system rendered incapable of reaction. This state of things is almost sure to be followed by death.

The first thing to be done to promote recovery is to empty the stomach by means of emetics, or the stomach-pump. The latter is preferable, if at hand, because the patient may be incapable of swallowing, or the stomach may have lost its tone, and be insensible to the action of an emetic. When the stomach has been emptied by the pump, emetics may be introduced by the same means. A dessert spoonful of wine of ipecacuan or antimony, or twenty grains of sulphate of zinc, or a purgative mixture, may be introduced in like manner: as also a purgative injection into the bowels. It is a great point to get the stomach and bowels to act, for this stimulates the rest of the system, and the more easily they may be induced to act, the greater probability is there of recovery. When the patient is beginning to recover, it may be judicious to take blood from the jugular vein, or from the temple by leeches, to relieve the fulness of the head. This is only to be judged of by a medical man. Fresh air also promotes recovery, and the occasional sprinkling of cold water upon the face. The body should also be well rubbed, as was before described. The posture of it should also be particularly attended to: the head and shoulders should be raised, and the patient should not be left alone till the recovery is complete.

Lightning.—The destructive powers of lightning are so great that nothing is able to resist them, in their full force. Not only are buildings set fire to, or rent from top to bottom in a moment, but the earth itself is sometimes cleft asunder by this awful element. No wonder that animals when exposed to it should be deprived of life. When an electric cloud passes over the earth, a continual discharge of electricity passes from it to the earth, accompanied by thunder and lightning. When any object is below the cloud which has a power of conducting the electricity to the earth, the electricity passes through it. Animal bodies are good conductors, and therefore attract the electricity; but if a taller object be near, which is also a good conductor, the electricity will pass through the taller one in preference. Therefore, persons who are exposed to a thunder-storm should be near some tall object, provided they are not close to it. If a person is within thirty feet of a tree, and the tree be struck, they will escape; but if they be under the tree for shelter, they will probably be struck. Even a pole ten feet long, stuck upright in the earth, at a short distance (twenty feet) from a person, is a sufficient protection, if the person lies down on the ground. Too often the individual is struck dead in the instant, and his clothes generally exhibit signs of having been burnt. Sometimes death is only apparent, and life may be restored by proper means. The general means are the same as in the case of drowning. The body must be placed upon a bed; warmth must be restored; the circulation must be revived; stimulants must be applied externally by friction, and internally by the stomach-pump. Injections must also be used, and the action of the heart must be solicited by gentle shocks of electricity or galvanism.

CHAPTER II.

ON POISONS, &c. By WILLIAM KING, M.D.

A poison is a substance which, when applied to the body in a particular manner, produces deleterious effects, and sometimes death.

Some substances when applied to the skin destroy its vitality: some produce a numbness in the part; some, when applied to the tongue, are absorbed into the system, and produce dangerous consequences; some when applied to a wound are so absorbed; others produce all their fatal effects only when taken into the stomach.

Poisons may be divided generally into mineral, vegetable, and animal.

Mineral Poisons.

The principal metallic poisons are preparations of arsenic, mercury, copper, antimony, zinc, lead, barytes.

These do not produce any dangerous effect unless taken into the stomach. The symp-

toms which follow are, violent pain and sense of burning heat in the stomach and bowels; thirst, and constriction of the mouth; violent vomiting, sometimes of bloody matter; violent purging, and hiccup. The pulse becomes quick, small, hard, irregular. The surface of the body generally becomes cold and clammy. The mind becomes anxious and alarmed. When the case ends fatally, delirium and convulsions come on, and continue till the patient is worn out and dies.

These symptoms are more or less severe when different poisons have been taken. ARSENIC begins to produce its effect within an hour, and is fatal within a few hours or days. It acts more immediately by producing inflammation in the stomach. The best antidote is said to be lime water, but unless it can be removed by means of the stomach-pump, and mucilaginous injections, there is little hope for the patient. Two grains are sufficient to destroy life, but it is always taken in much larger quantities when there is an evil intention.

CORROSIVE SUBLIMATE.—This is a preparation of mercury. One grain will produce unpleasant symptoms, and a few grains will destroy life. Besides the general effects of metallic poisons, mercury produces salivation and an unpleasant taste in the mouth. The salivation distinguishes it from other poisons. The best antidote is white of egg, which produces a chemical decomposition. This remedy is always at hand. Milk is also recommended to be drank in large quantities, and also gum water, barley water, and sugar and water.

COPPER.—All the preparations of copper are poisonous. Even the verdigris which sometimes collects in copper vessels used in cooking has produced fatal effects. When acids are used in cooking they easily combine with the copper and produce a poison. A few grains are sufficient to destroy life. The presence of copper is easily known by putting a bright knife into the suspected substance. The copper is precipitated upon the iron in a metallic state. The best antidote is the white of eggs; and sugar and water is also useful.

ANTIMONY.—The preparation of antimony, which is called tartar emetic, is a powerful medicine. When taken in very small doses, as a quarter or half a grain, it is useful in counteracting inflammatory fever. When the dose is larger it produces sickness, and in still larger doses it would produce all the dangerous effects of metallic poisons. This substance is particularly dangerous in the case of children, and may easily produce death if given injudiciously, without medical advice. There is another preparation called muriate of antimony, or butter of antimony, which is still more dangerous than the former. It is not, however, so commonly met with. The best remedy is to evacuate the stomach with the stomach-pump, and then to take large draughts of sugar and water, and a decoction of gall-nuts.

ZINC.—The sulphate of zinc is often used as an emetic, because it produces vomiting in a few minutes. But when taken in large quantities it will produce inflammation of the stomach, and the other dangerous symptoms of metallic poisons. The best remedies are lime-water, white of eggs, and sugar and milk and water.

LEAD.—When any preparation of lead is swallowed, in addition to the usual symptoms, there is a sweetish taste in the mouth. Lead easily combines with vinegar, and thus vessels glazed with the preparations of lead, and filled with vinegar as for pickles, produce a poisonous liquid. The preparations of lead, sugar of lead, goulard water, red lead, &c., when taken in large quantities, produce the deleterious effects of metallic poisons. When taken in smaller doses, chronic effects are produced, as violent spasmodic pains in the bowels, and other parts of the body. Painters are very subject to these chronic pains, from the influence of the preparations of lead they use. The remedies for large doses of lead are to remove them from the stomach, by means of the stomach-pump, or an emetic of ipecacuan; and then to take large draughts of sugar and water and milk and water. The chronic effects can only be cured by medical men. Sugar of lead is sometimes added to sour liquids, as cider and perry, and some kinds of wine, to destroy the acid and sweeten them. All such liquors are poisonous; the quantity of lead is not sufficient to produce immediate illness, but when such liquids are drank habitually, chronic colic is sure to follow.

BARYTES.—There is a metal called barytes, which is very rarely met with, but of which the preparations are a deadly poison. The carbonate of barytes is sometimes used as a poison for rats. It is also used for a white paint for artists, because it does not tarnish by exposure to air. The best antidote against barytes is Glauber's salts or Epsom salts. When these have acted on the bowels, and vomiting has brought away the contents of the stomach, sugar and milk and water may be drank.

The above are the principal metallic poisons and their antidotes, proper to be mentioned in a popular work. The antidotes may be safely employed by the friends till medical assistance can be procured, which should always be done as soon as possible, as other remedies ought to be used, which only medical men are judges of; such as leeches to the stomach, various purgatives, anodynes, and other internal medicines.

Persons are sometimes poisoned by drinking strong acids, or caustic potash or soda.

SULPHURIC ACID AND NITRIC ACID, if drank in quantities and in a concentrated

state, excoriate the mouth and œsophagus and stomach, and produce violent burning pain and inflammation. The nitric acid gives a yellow colour to the lips. The best remedy is magnesia or subcarbonate of potash dissolved in water. Chalk and water may also be given; but the quantity swallowed at once should be small, as the sudden mixture produces great heat. The mixture of magnesia with the acid forms a neutral salt, which acts as a purgative, and thus carries off the offensive matter.

Caustic Potash and Soda.—When these substances (called alkalis) are taken, the effect is of a rapidly corroding nature: they have the property of destroying the animal matter, and, as it were, of burning it. Their nature is directly opposite to that of the strong acids, though the deleterious effect is the same. The remedy is just the reverse of the former. Acids and alkalis have opposite qualities, and readily combine together, and neutralize each other. The acids are neutralized and rendered harmless by alkalis, like magnesia or potash; and the alkalis are rendered harmless by acids. Sulphuric acid diluted might be given on these occasions: but a pleasanter and milder remedy is vinegar or lemon juice. This may be drank in moderate draughts repeated, till all the alkali may be supposed to be decomposed, and then soothing draughts of sugar and milk and water may be continued.

Phosphorus.—This substance is seldom met with in private houses. It is chiefly used in chemical experiments. A few grains of it are highly poisonous, and no remedy for it is known. The best treatment is to wash out the stomach with the stomach-pump, and then to take large draughts of sugar and water and milk.

Vegetable Poisons.

Vegetable poisons may be divided into those that are acrid, and those that are narcotic.

Acrid Vegetable Poisons.

The principal ones are the following:

Aconitum napellus; monk's-hood, or wolf's-bane.
Helleborus Niger; black and fetid hellebore, or bear's-foot.
Elaterium; wild cucumber.
Coloquintida; colocynth, or bitter apple.
Gamboge.
Euphorbia; spurge, a plant bearing seed like capers.
Arum; cuckoo pint, or wake robin, bearing beautiful red berries.
Poisonous mushrooms.

The symptoms produced by all these plants, when taken in large quantities, are nearly the same: viz. violent vomiting and purging; great pain in the stomach and bowels; difficult breathing; giddiness; fainting; sinking of the pulse; cold sweats; convulsions; paralysis; death.

The treatment which ought to be pursued is the same. The stomach should be emptied by means of the stomach-pump, which is here very certain of success, because the substances are soluble; or an emetic of sulphate of zinc, from fifteen to thirty grains, should be given. Mild mucilaginous fluids should be drank, as thin gruel, milk and water; and when the stomach has been cleared of the poison, coffee and lemon-juice or other mild acids may be taken.

Should severe inflammatory symptoms come on, they can only be treated by medical men.

Narcotic Vegetable Poisons.

The principal of these are, opium, hemlock, henbane, dulcamara or the woody nightshade, laurel water, Prussic acid, stramonium or the thorn apple, tobacco, digitalis, nux vomica, Belladonna.

The symptoms produced by these substances are stupor, drowsiness, delirium, dilated pupil of the eye, quick breathing, variable pulse, convulsions, paralysis, death.

The proper treatment is to empty the stomach by means of the stomach-pump, or an emetic of sulphate of zinc, drinking the mucilaginous fluids, thin gruel, milk and water, barley-water; and then to give coffee, weak acids, and cordials, as brandy and water, and ammonia or spirit of hartshorn. The patients must not be allowed to sleep, but must be kept walking about, between two persons, till the symptoms subside. If the dose of the poison is not sufficient to destroy life, the symptoms will subside in a certain number of hours, from twelve to twenty-four, according to the dose taken.

Animal Poisons (called also Septic Poisons, from their tendency to produce putrefaction.)

Some of these poisons arise from the bite of certain animals, as the viper, rattlesnake, the mad dog, and, in a minor degree, from the sting of the hornet, the wasp, and the bee. An acute pain is felt in the wounded part, which soon extends over the limb, and sometimes over the whole body. The limb swells and becomes hard and pale, but soon changes to a bluish, livid colour, and at last mortification ensues. Sickness and faintings come on, with convulsions, difficult breathing, small irregular pulse, cold sweats, deranged

sight and intellect, and at length death. But the same poisonous secretion is harmless when taken into the stomach. The poison acts by being mixed up with the blood, and carried into the circulation. For this reason, a ligature or tight bandage, applied immediately round the bitten limb above the bite, has sometimes been found efficacious in preventing any ill effects; and in the sting of small animals, some persons effect a cure by squeezing the part tightly for a few minutes. It may also retard the absorption of the poison till other means can be resorted to. In bites from the more deadly animals, the part should be cut out by a surgeon, and well washed for many hours with warm water. Cupping glasses should be applied to the part, to draw away the blood and poison mixed with it. The wound should then be washed with pure ammonia, which, in the less important bites, is said to give speedy relief. The acetate of ammonia is also a valuable remedy, called commonly the spirit of mindererus.

In some parts of America the natives have a cure for the bite of venomous serpents, which is unknown in Europe.

The nature of hydrophobia is not known to medical men. The bites of mad dogs are not always poisonous, but we have no means of ascertaining at the instant whether they are so or not. The only remedy is a free excision of the parts, at the instant, with the application of the remedies mentioned above: and there is some reason to think that mercurial plasters and salivation have sometimes been useful.

Poisonous Fish.

The secretions of animals which are poisonous when introduced into wounds, are not so when introduced into the stomach: but some kinds of fish are poisonous when eaten, such as the dolphin, Conger eel, sea-lobsters, some kinds of muscles, and even raw oysters, in certain cases and constitutions.

These fish produce sickness, hiccough, giddiness, head-ache, heat, itching, and eruption of the skin, fainting, cold and clammy perspirations, and even death. Some kinds of shell-fish are particularly dangerous to females after confinement. The late Dr. Denman knew many females die from eating raw oysters at that time.

The treatment consists in emptying the stomach, as in the case of other poisons, and then purging the bowels, and afterwards giving weak acids, and mild stimulants and cordials, as brandy, æther, ammonia.

Burns and Scalds.

When hot bodies are applied to the surface of the body, they destroy the vitality of the part. Either fire or boiling-water are sufficient to do this.

When the life of a part is destroyed by burning, the dead part still adheres to the living part which surrounds it. The living part then commences a process by which the dead part is gradually separated, and a new part put in its place. This is called sloughing. The process is a truly wonderful one, and seems as if the living parts were endowed with intelligence, and understood what they were about. When the local injury takes place, it is accompanied with pain, tenderness, and swelling. If the injury be great, these produce an effect on the constitution, and general fever comes on. These are serious cases, and require immediate medical aid.

When the burn is not extensive, the part may be kept constantly wet with Goulard water, spirit of mindererus, and may be protected from the external air, by covering it with oil. The more it is kept from the air, the less pain will be experienced, and this is the object of the oil. For the same purpose flour is a good application. It should be applied freely, and frequently renewed. Some persons recommend wrapping up the part immediately in cotton wool, and leaving it so untouched till well. This is, no doubt, an excellent remedy, and always, as soon as the first painful symptoms have subsided, the less the part is interfered with the better. Nothing retards the cure more than daily examining and handling the parts.

SCALDS.—When hot water is applied to the skin, the cuticle is killed, and immediately separated from the skin beneath, as in the application of a blister. The same pain and swelling take place as in burns, but the swelling is less in degree. The living parts begin immediately to replace the dead ones, by throwing out a quantity of coagulable lymph, and purulent matter. The treatment should be the same as for burns.

APPENDIX II.

AN ABRIDGMENT OF THE MORE RECENT LEGAL PROVISIONS BY STATUTE WHICH PARTICULARLY RELATE TO FARMING AND RURAL AFFAIRS.

It would be obviously impossible to comprise in a mere Appendix the whole law affecting agricultural and horticultural matters, which could only be adequately treated of in a volume of the full size of the present. It will, however, probably be useful to put our readers in possession of those statutory provisions, which, on account of their comparatively recent date, are less likely to be generally known, or to be found in other works to which they may have access. The period of twenty years, viz. from 1810, has been selected as the limit for this purpose. One exception has been made, in the instance of the statute duty and composition in lieu thereof.

List of the Statutes.

13 George III.,	c. 78,	General Highway Act, amended by 34 Geo. III., c. 64 and 74; 44 Geo. III., c. 52; 54 Geo. III. c. 109; and 55 Geo. III., c. 68.
55 ,,	c. 68,	Stopping up unnecessary Roads.
56 ,,	c. 50,	Farming Stock taken in Execution.
57 ,,	c. 52,	Extending Remedies of 11 Geo. II., c. 19.
57 ,,	c. 93,	Costs of Distresses for small Rents; extended by 7 and 8 Geo. IV., c. 17, to Distresses for Rates, &c.
58 ,,	c. 75,	Buying and selling of Game.
1 George IV.,	c. 87,	Recovery of Possession by Landlords.
3 ,,	c. 71,	Cruel Treatment of Cattle.
3 ,,	c. 126,	Turnpike Roads, amended by 4 Geo. IV., c. 16 and 95; 5 Geo. IV., c. 69; 7 and 8 Geo. IV., c. 24; and 9 Geo. IV., c. 77.
5 ,,	c. 74,	Weights and Measures.
7 & 8 ,,	c. 18,	Prohibiting Man-traps and Spring-guns.
7 & 8 ,,	c. 29,	Larceny, } Consolidation Acts.
7 & 8 ,,	c. 30,	Malicious Injuries to Property, } Consolidation Acts.
9 ,,	c. 69,	Destroying Game by Night.
1 William IV.,	c. 70,	Recovery of Possession by Landlords.

1. *Statute Duty on Highways.*

The surveyor of the highways, together with the inhabitants and occupiers of lands, tenements, woods, tithes, and hereditaments, shall, at proper seasons, in every year, use their endeavour for the repair of the highways, and shall be chargeable thereto as followeth: that is to say—

Every person keeping a waggon, cart, wain, plough, or tumbrel, and three or more horses or beasts of draught used to draw the same, shall be deemed to keep a team, draught, or plough, and be liable to perform statute duty with the same, in the parish, township, or place, where he resides, and shall, six days in every year, (if so many days shall be found necessary,) to be computed from Michaelmas to Michaelmas, send on every day, and at every place, to be appointed by the surveyor, for amending the highways in such parish, township, or place, one wain, cart, or carriage, furnished, after the custom of the country, with oxen, horses, or other cattle, and all other necessaries fit to carry things for that purpose, and also two able men with the same: which duty so performed shall excuse every such person from his duty in such parish, township, or place, in respect of all lands, tenements, goods, tithes, or hereditaments, not exceeding the annual value of 50*l.* which he shall occupy therein.—34 Geo. III. c. 74. s. 4.

Every person keeping such team, draught, or plough, and occupying in the same parish, township, or place, lands, tenements, woods, tithes, or hereditaments of the yearly value of 50*l.* over and beyond the said yearly value of 50*l.* in respect whereof such team duty shall be performed; and every such person occupying lands, tenements, woods, tithes, or hereditaments, of the yearly value of 50*l.* in any other parish, township, or place, besides that wherein he resides; and every other person, not keeping a team, draught, or plough, but occupying lands, tenements, woods, tithes, or hereditaments, of the yearly value of 50*l.* in any parish, township, or place,—shall find and send one wain, cart, or carriage, furnished with not less than three horses, or four oxen and one horse, or two oxen and two horses, and two able men to each wain, cart, or carriage; and, in like manner, for every 50*l.* a-year respectively which every such person shall further occupy in any such parish,

township, or place respectively: such wains, carts, or carriages, to be employed by the surveyor in repairing the highways within the parish, township, or place, where such estate lies.—34 Geo. III. c. 74. s. 4.

Every person who shall not keep a team, draught, or plough, but shall occupy such estate under the yearly value of 50*l.* in the parish, township, or place where he resides, or in any other parish, township, or place; and every person keeping a team, draught, or plough, and occupying such estate under the yearly value of 50*l.* in any other parish, township, or place, than that wherein he resides,—shall respectively contribute to the repair of the highways, and pay to the surveyor, in lieu of such duty, the sums following: viz. For every 20*s.* of the annual value of such lands, tenements, woods, tithes, or hereditaments, one penny for every day's statute duty; and, in like manner, shall pay one penny for every 20*s.* of the annual value of such estate which he shall occupy in any such parish, township, or place respectively, above the annual value of 50*l.* and less than 100*l.*; and so for every 20*s.* that each progressive and intermediate annual value of 20*s.* of the lands, &c., which he shall so occupy, shall fall short of the further increase of 50*l.* in every parish, township, or place, where such lands, tenements, woods, tithes, and hereditaments, shall respectively lie, for every day's statute duty so to be required as aforesaid.—*Ibid.*

Provided, that no person keeping such team, draught, or plough, and performing duty with the same as aforesaid, in the parish, township, or place, where he resides, and not occupying lands, tenements, woods, tithes, or hereditaments, within the same, of the yearly value of 30*l.*—shall be obliged to send more than one labourer with such team, draught, or plough.—*Ibid.*

All which said several sums shall be considered as compositions, and shall be paid, to the surveyor, at the time the compositions are to be paid under the authority of the act, or within ten days after; or, in default of such payments, the surveyor shall apply to a justice acting for such district, who shall summon such defaulter to appear at some special or petty sessions to be holden for such district, at which two justices, at the least, shall be present, to show cause why he refused or neglected to pay; and, in default of appearance, or if on appearance he shall not make it appear to the satisfaction of such justices, that he is poor and indigent, and, as such, an object deserving relief; such money shall be levied by distress, in like manner as the forfeitures for neglect of statute duty. Provided that, when the justices shall discharge any poor person from payment of such rate or composition money, such person shall, at the same time, be discharged from any expenses in consequence thereof.—*Ibid.*

Every person who shall not keep a team, draught, or plough, but shall keep one or more cart or carts, and one or two horses or beasts of draught only, used to draw in each of such carts upon the highways, shall be obliged to perform his statute duty, for the like number of days, with such cart or carts, and horse or horses, or beasts of draught, and one labourer to attend each cart; or to pay for the lands, tenements, woods, tithes, and hereditaments, which he shall occupy, according to the rate hereinafter mentioned, at the option of the surveyor.—*Ib.* s. 2.

Every person who shall keep a coach, post-chaise, chair, or other wheel carriage, and not keep a team, draught, or plough, nor occupy lands of the value of 50*l.* a-year in the parish, township, or place, where he resides, shall pay to the surveyor 1*s.* in respect of every such day's statute duty, for every horse used to draw in any such carriage; or shall pay according to the value of the lands, tenements, or hereditaments, which he shall occupy, at the option of the surveyor.—*Ibid.*

And, if the teams, draughts, or ploughs, or any of them, shall not be thought needful, by the surveyor, on any of the said days; then every such person who should have sent any such team, draught, or plough, according to the directions aforesaid, shall, according to the notice given to him by the surveyor, send unto the said work, for every one so spared, three able men; or pay 4*s.* 6*d.* in lieu thereof, at the option of the surveyor.—*Ibid.*

And, where the employment for teams is of such sort, that two horses will be sufficient for one cart, or where a stand-cart with one horse shall be necessary, the surveyor may call upon any person liable to send a team, draught, or plough, according to this act, who keeps one or more cart or carts, and three or more horses, to send such cart or carts, horse or horses, to perform his statute duty, as the surveyor shall find most convenient; and he shall allow every such stand-cart and one horse as half a team, and every cart and two horses as two-thirds of a team. And, if a waggon shall be found necessary for any particular business, the surveyor may require the duty, or any part thereof, to be performed with such waggon by any person who keeps one. Which directions of the surveyor shall be observed, or the person liable to perform such duty shall forfeit such sum as the duty so required of him shall bear, in proportion to the forfeiture hereby inflicted for every neglect in performing duty with a team, draught, or plough.—13 Geo. III. c. 78. s. 36.

In what Manner the Statute Duty is to be performed.—The surveyor shall give to, or cause to be left at the abode of, every person liable to perform such duty, four days' notice, at least, of the day, hour, and place, upon which each of the day's duty shall be to be performed.—13 Geo. III. c. 78. s. 37.

And all persons shall have and bring with them such shovels, spades, picks, mattocks, and other tools, as are useful.—34 Geo. III. c. 74. s. 2.

And, all the said persons and carriages shall diligently perform the work to which they shall be appointed by such surveyor, for eight hours in every day, within such parish, or in getting materials in and from any other parish, to be employed in the repair of the highways of the parish for which they shall perform duty.—34 Geo. III. c. 74. s. 2.

And, if any person sending a team shall not send a sufficient labourer besides the driver (except as before mentioned), or, if any such labourer or driver, or any other labourer, or the driver of any cart, shall refuse to work, during the time above mentioned, according to the direction of the surveyor; or, if any driver shall refuse to carry proper loads, it shall be lawful for such surveyor to discharge such team, cart, or labourer, and to recover, from the owner, the forfeiture which such person would have incurred in case no such team, &c. had been sent.—*Ibid.*

And, every person making default in finding and sending such wain, cart, or carriage, furnished as aforesaid, and such able men with the same, as herein required, or in performing the said duty in manner by this act directed, shall, for every default, forfeit 10*s.*; for every default in sending a cart with one horse and one man, 3*s.*; and, for not sending a cart with two horses and one man, 5*s.*; and, every person making default in sending such labourer, and every person making default in performing such labour at the time and place, and in manner directed by this act, or in paying composition-money for the same, shall, for every such neglect, forfeit 1*s.* 6*d.*—All which forfeitures shall be applied for the use of the highways within the parish.—13 Geo. III. c. 78. s. 37.

And the surveyor shall equally demand such duty from every person liable, without favour.—*Ibid.*

Composition in lieu of Statute Duty.—By 44 Geo. III. c. 52, Any persons liable to perform statute duty, by sending one or more teams, draughts, or ploughs, with men, horses, or oxen, in manner mentioned in the 34 Geo. III. c. 74, may compound for the same, if they shall think fit, by paying to the surveyor of the highways, at the time, and in the manner mentioned in that act, such sums of money as the justices for the limits wherein the parish, township, or place, for which the said duty is liable to be performed, is situate, or the major part of them, at their special session to be held in the first week after Michaelmas quarter-session in every year, shall adjudge and declare to be reasonable, not exceeding 12*s.* nor less than 3*s.* for each team, draught, or plough, for each day; and, in default of their adjudging and declaring the same, 6*s.* for, and in lieu of, every day's duty for each team, draught, or plough; and, for each cart with two horses or beasts of draught, not exceeding 8*s.* nor less than 3*s.*; and, in default of their adjudging and declaring the same, the sum of 4*s.*; and, for each cart with one horse or beast of draught, not exceeding 6*s.* nor less than 2*s.*; and, in default of their adjudging and declaring the same, the sum of 3*s.*—s. 2. See 54 Geo. III. c. 109. s. 4. page xiii.

" And, whereas it may frequently happen, that persons wholly gaining their livelihood by the wages of daily labour, and occupying rateable tenements within a parish, by reason of age, sickness, a numerous family, or misfortune, may be in poor and indigent circumstances, and it may be expedient, in certain cases, to discharge such persons from all rates, assessments, or compositions whatsoever:" It is, therefore, enacted, that, on the application of any poor and indigent person to be discharged from the rate or composition, made to any two justices at any special or petty sessions, held for the limits wherein such poor and indigent person shall reside, the said justices (having first given notice to the surveyor to appear on the part of the parish) shall inquire and examine into the situation and circumstances of the person making such application; and, if it shall appear to the satisfaction of such justices, that such person is really poor and indigent, and a deserving object of such relief, the said justices may exempt such poor and indigent person from the payment of all rates, assessments, or compositions whatsoever.—34 Geo. III. c. 74. s. 5.

But, if it appear to the justices, at their special sessions, to be held in the week next after Michaelmas quarter-sessions, or at any other special or petty sessions, held within the limits of any parish, at which two or more justices shall be present, that, from the directions before given for performing and compounding the statute-duty, there will be difficulty in procuring the necessary carriages, or a sufficient number of labourers for the repair of the highways, in any particular parish, within their limits, without paying high prices for the same; it shall be lawful for such justices to order the team duty hereby required, or so much thereof as they think fit, to be performed in kind, within every parish, &c. except in respect of such teams as belong to persons who do not occupy lands, &c. of the annual value of 30*l.* within the same; and, also, to order all such persons as shall gain their living by the wages of daily labour, or such part of them as they shall think fit, to perform six days' labour upon such highways in kind, either by themselves or others, in case so many days' duty shall be required, upon being paid for such labour the usual wages given to labourers in such parish.—*Ib.* s. 6.

But, if part of such teams or labourers only are required, it shall be directed by the said order of the justices in some given proportion, as one-half, third, or fourth, part thereof; and the surveyor shall, in that case, at a public vestry for such parish, put the names of all persons liable to send such teams into one hat or box, and the names of all persons liable to perform such labour into another hat or box, and some inhabitant then present shall draw out such number from each as shall be equal to the proportion ordered by the

justices; and the persons drawn shall perform such duty in kind for that year; and, if such order shall be made or continued in the subsequent year, the same method shall be observed, but the names drawn in the preceding year shall not be put into such hat or box; and, in every succeeding year, such method shall be observed by such surveyor, so as to render the duty to be performed in kind equal amongst the persons liable thereto; which order of the justices, so far as the same shall be extended, shall supersede the power or liberty of compounding, and shall be binding, and shall continue in force until discharged or varied by the justices at some subsequent special sessions for the highways within such limit, to be held in the week after Michaelmas quarter-sessions.—*Ib.*

And, if any person shall keep a team, and shall not occupy lands, &c. of 30*l.* per annum, in the parish where he shall reside, but shall in part maintain his horses and beasts of draught used in such team upon lands in adjacent parishes, it shall be lawful for the justices, at some special sessions, to mitigate the duty or composition, as they think just. —13 Geo. III. c. 78. s. 40.

And, the surveyor of every parish shall, on some Sunday in November, in every year, cause ten days' notice at least to be given in the church or chapel; and, if no church or chapel, then at the most public place there, and repeat the like notice in such church, &c. on the next Sunday, of the time and place when and where the persons permitted, and inclined to compound, may signify to such surveyor their intention to compound; and, all persons signifying the same, who shall then, or within one month after, pay to such surveyor the composition, shall be discharged from the performance of such duty, which composition shall be employed by the surveyor for the use of the highways; and no composition shall be permitted, unless paid at the day, or within the time aforesaid.—*Ib.* s. 41.

But, where the occupation of any lands, &c. shall be changed, or any new inhabitant shall come to reside in such parish, &c. after the time appointed for such composition, then the persons occupying such lands, &c. or so residing in such parish, shall be allowed to compound afterwards: provided they pay the composition-money within fourteen days after they enter upon such lands, &c. or come to reside in such parish; and, every tenant of lands, &c. who intends to quit the possession thereof within six months from the time fixed for making such composition, may compound for half the duty, and the succeeding tenant may compound or perform duty in kind for the other half.—*Ibid.*

And, if the surveyor shall receive from any person a composition for more duty than shall be required from the other inhabitants within the same parish, for the same year, he shall repay such extraordinary composition to such persons, so as to bring the duty to an equality amongst all such inhabitants.—*Ibid.*

And, in every parish where any person shall keep a draught or plough, and no carriage, he shall pay to the surveyor 1*s.* for every horse, or pair of oxen or neat cattle, used in such draught, for every day's statute-duty, on the day such duty is to be performed, or pay according to the rate aforesaid for the lands, &c. which he shall occupy in such parish, at the option of the surveyor.—*Ib.* s. 42.

What Persons may be Assessed to a Rate for defraying the extraordinary Charges of such Repairs.—" As in some parishes there may not be materials for the repair of the highways, by reason whereof the surveyor may be forced to buy materials, and to make recompense for damage done by getting thereof; and, as no provision is made for raising a fund to reimburse the expenses thereof; and, also, such expenses as the said surveyors may incur, by erecting guide posts, &c.; and, by making or repairing trunks, tunnels, plats, bridges, or arches; and, by rendering satisfaction for damages done to lands by making of new ditches or drains; nor, for the salary to be paid by such parish to such surveyors:" it is, therefore, enacted, That, upon application made by such surveyor to the justices, at their special sessions, and oath made of the money which he hath *bonâ fide* laid out, or which will be required for the purposes aforesaid, the said justices, or two of them, shall, by warrants under their hands and seals, cause an assessment to be made upon all occupiers of lands, &c. within such parish, and the same shall be collected by such persons, and allowed in such manner as the justices, by their order at sessions, shall direct; and the money raised shall be employed and accounted for, according to the direction of the justices, and the said assessment shall be levied as after mentioned; but no such assessment in one year shall exceed 6*d.* in the pound of the yearly value of the lands.—*Ib.* s. 30.

Also, if upon application of the surveyor of the highways for any parish, to the justices for the limit wherein such parish lieth, at their general or quarter sessions, or at some special sessions for the highways, the said justices shall be satisfied, by oath, that the duty and the money authorised to be collected has been performed, applied, and expended according to this act, or shall be satisfied that the common highways, bridges, causeways, streets, or pavements, belonging to such parish, are so far out of order that they cannot be sufficiently amended, paved, cleansed, and supported, by the means before prescribed (notice being first given of such intended application at the church or chapel, on some Sunday preceding such quarter or special sessions; or, if the place be extra-parochial, notice in writing being first given of such intended application to some of the principal inhabitants residing in such extra-parochial place, a week at least before such sessions); an equal assessment upon all occupiers of lands, &c. within such parish, shall be made and

collected by such persons, and allowed in such manner, as the justices, by their order at such sessions, shall direct; and, the money thereby raised shall be employed and accounted for, according to the orders of the said justices, towards amending, paving, cleansing, and supporting, such highways, causeways, streets, pavements, and bridges.—*Ib.* s. 45.

But the assessment last authorised, and the assessment before authorised, for buying materials, making satisfaction for damages, erecting guide-posts, and paying the surveyor's salary, shall not together, in one year, exceed 9*d.* in the pound.—*Ib.* s. 46.

And, if any person shall refuse or neglect to pay the sums assessed upon him, within ten days after demand, the same may be levied, by the surveyor or persons authorised, by warrant under the hand and seal of one justice, by distress and sale; and, in default of distress, it shall be lawful for such justice to commit the person refusing to the common jail, there to remain until he shall have paid the sum assessed, and the costs.—*Ib.* s. 67.

In all cases in which it shall be made to appear to two or more justices of the peace acting within the district, by the surveyors of the highways or of any turnpike-road, that the maintenance and repair thereof can be more effectually carried on by a composition in money than by a performance of the statute duty in kind, they shall be at liberty to require such composition in money, upon receiving an authority under the hands and seals of the said justices, in lieu of either the whole or of any certain part of the statute-duty, from the several persons who are bound by law to perform such statute-duty; and the justices, at their special sessions held in the week next after Michaelmas, yearly, shall fix such rates as they shall adjudge reasonable, as a composition in lieu of the teams, carts, horses, oxen, or labour, which such persons are bound in the proportions now fixed by law to provide or perform; which rates the said justices are required annually to make known at such special sessions, due regard being had to the actual wages of labour, and to the actual rate of hiring teams, draughts, ploughs, carts, horses, or oxen, in the parish or district in which such composition is required; and such composition shall be paid in the same manner, and within the same period, and subject to the same regulations as are now by law established for enforcing the payment of compositions in lieu of statute-day. But, where the whole composition in money shall not be required in lieu of the whole of the duty in kind, such composition shall be demanded in fair and equal proportions from each person liable to pay the same, unless any of the said persons shall prefer to pay a composition for the whole of their statute-duty, according to the rates fixed in the manner herein directed.—54 Geo. IV. c. 109. s. 4.

And all persons who are liable, under any of the provisions of any of the acts, to contribute to the repair of the highways by a payment of money in lieu of statute-duty, shall contribute thereto in lieu of every day's statute-duty, for every 20*s.* of the actual annual value at the time of making the said assessment of the lands, tenements, woods, tithes, and hereditaments, which such persons shall respectively occupy in the parish, township, or place, where they reside, or in any other parish, township, or place, a sum equal to one-fiftieth part of the sum fixed by the justices, at the time and in the manner by this act directed, as the composition for one day's labour of a cart, wain, or carriage, furnished with three horses and two able men, omitting any fractional part of the said sum which does not amount to one farthing; and all persons occupying more than 50*l.* per annum in the parish, township, or place wherein they reside, or in any other parish, township, or place, and less than 100*l.* per annum, shall contribute to the repairs of the highways in lieu of every day's statute-duty, for every 20*s.* of the actual annual value at the time of making the said assessments of the lands, tenements, woods, tithes, and hereditaments, which such persons shall respectively occupy over and beyond the said sum of 50*l.* per annum, and under 100*l.*, a sum equal to one-fiftieth part of the sum fixed by the said justices, at the time and in the manner by this act directed, as the composition for one day's labour of a cart, wain, or carriage, furnished with three horses and two able men, omitting any fractional part of the said sum which does not amount to one farthing; and so on progressively for every 20*s.* of the actual annual value of the lands, tenements, woods, tithes, and hereditaments, which they shall respectively occupy over and beyond every additional 50*l.* per annum; and the said sums shall be paid in the same manner and within the same period, and subject to the same regulations as are now by law established for enforcing the payment of composition in lieu of statute-duty.—*Ib.* s. 5.

And every person who shall keep a coach, post-chaise, chair, or other wheel carriage, and not keep a team, draught, or plough, nor occupy 50*l.* per annum in the parish, township, or place, where he resides, shall pay to the surveyor, in respect of every day's statute-duty, for every horse which he shall use in drawing such carriage, such a sum as the justices shall, at the time and in the manner by this act directed, fix as the composition for one day's work of a horse; or shall, at the option of the surveyor, pay in lieu of every day's statute-duty, for every 20*s.* of the actual annual value of the lands, tenements, woods, tithes, and hereditaments, which he shall respectively occupy, a sum equal to one-fiftieth part of the sum fixed by the justices, as the composition for one day's labour of a cart, wain, or carriage, furnished with three horses and two able men, omitting any fractional part of the said sum which does not amount to one farthing: and the said sums shall be paid in the same manner, and within the same period, and subject to the same regulations,

as are now by law established for enforcing the payment of compositions in lieu of statute-duty.—*Ib.* s. 6.

All persons who shall refuse or neglect to perform any part of their statute-duty in kind, on being regularly summoned by the surveyor, shall forfeit a sum equal to twice the amount of the composition, according to the rates fixed by the justices under this act; and the said persons shall also be liable to perform the said statute-duty which they have so neglected or refused to perform, either in the same or in the following year; the payment of such forfeitures, and the arrears of such statute-duty, to be enforced and applied to the benefit of the highway or turnpike road, as the case may be, to which the original neglected duty was due or owing, by the surveyor, and under the same regulations, and in the same manner as other forfeitures may be levied, and statute-duty may in other cases be enforced by any of the provisions of any of the acts.—*Ib.* s. 7.

The justices of the peace and magistrates of all cities, corporations, boroughs, precincts, liberties, and other separate jurisdictions, are authorised to put in execution every part of this act within their respective jurisdictions, so far as the provisions thereof are applicable, in as full and ample a manner as the justices of any county or of any division thereof.—*Ib.* s. 8.

But nothing in this act shall alter the several recited acts, nor any act or acts passed subsequently to the said acts, regarding the highways or turnpike roads; but the same, where not expressly amended or altered by this act, shall remain in as full force as at the time of passing this act; and all their powers, authorities, provisions, regulations, and forms, shall be applicable, not only to the carrying those acts into execution, but also this act, so far as the same are adapted thereto, and are not expressly varied or altered by this act.—*Ib.* s. 9.

As the before-mentioned provisions are numerous and complicated, the following Abstract thereof, so far as relates to the description of the different persons thereby made liable to statute duty, or to pay a composition in lieu thereof, with the nature and extent of their liability, will probably be found useful. By these Acts,

EVERY PERSON		IS LIABLE TO
Residing in the parish or place for which the statute duty is required; keeping a team draught, or plough, and occupying premises of the annual value of 50*l*. per annum,	1.	Statute duty; viz. six days (if required) with one wain, cart, or carriage, furnished according to the custom of the country, with horses, oxen, or cattle, and two able men.
Or if the premises are under 30*l*. per annum,	2.	Ditto, ditto, with one man.
And for every additional 50*l*. above the first 50*l*. per annum,	3.	Statute duty; viz. six days (if required) with one wain, cart, or carriage, and not less than three horses, or four oxen and one horse, or two horses and two oxen and two men.
Not residing in the parish or place, but occupying premises of the yearly value of 50*l*., whether keeping a team, draught, or plough, or not,	4 and 5.	Ditto, ditto, ditto.
And for every additional 50*l*. per annum,	6.	The like statute duty.
Occupying premises under 50*l*. per annum, whether residing in the parish or place or not, and whether keeping a team, draught, or plough, or not,	7 and 8.	Composition; viz. one-fiftieth of the price fixed for a day's labour of a team for every 1*l*. of the annual value of the premises—for six days, if required.
Occupying premises above 50*l*. and under 100*l*. per annum, whether residing in the parish or place or not,	9.	Composition; viz. one-fiftieth of a day's labour of a team, for every 1*l*. of the annual value of the premises between 50*l*. and 100*l*. —for six days if required.
Residing in the parish or place, and keeping one or more cart or carts, and one or two horses or beasts of draught, only used in such carts upon the highways, but not keeping a team draught or plough,	10.	Statute duty; viz. six days with his cart or carts, horse or horses, and one labourer to attend each cart. Or Composition, according to the value of the lands he occupies, after the rates before mentioned.

11.

Keeping a coach, post-chaise, chair, or other wheel carriage, but not keeping a team, draught, or plough, nor occupying premises of 50*l*. per annum,	Composition, according to the lands he occupies after the rates before mentioned. Or Composition for each horse, according to the price fixed for a day's labour of a horse.

In explanation of the above abstract it is to be observed that the "occupancy," in respect of which the liability arises, is extended by the Acts to "all lands, tenements, woods, *tithes*, and hereditaments;"—the value of the premises is defined to be their "*actual* annual value;" and a person keeping "a team, draught, or plough," is defined to be such person as "keeps a waggon, wain, cart, plough, or tumbrel, and three or more horses or beasts of draught used to draw the same.

2. *Turning of Highways, and stopping up unnecessary Roads.*

After reciting 13 Geo. III. c. 78, s. 19, it is enacted, that when it shall appear, upon the view of any two justices of the peace, that any public highway, or public bridleway or footway, may be diverted, so as to make the same nearer or more commodious to the public, and the owner or owners of the lands and grounds through which such new highway, &c. so proposed to be made shall consent thereto, by writing under hand and seal, it shall be lawful, by order of such justices at some special sessions, to divert and turn and to stop up such footway, and to divert, turn, stop up, and inclose, sell and dispose of such old highway or bridleway, and to purchase the ground and soil for such new highway, bridleway, or footway, by such ways and means, and subject to such exceptions and conditions in all respects, as in the said recited act mentioned with regard to highways to be widened or diverted; and also when it shall appear, upon the view of any two justices, that any public highway, bridleway, or footway is unnecessary, it shall be lawful, by order of such justices, to stop up and to sell and dispose of such unnecessary highway, &c. by such ways and means, and subject to such exceptions and conditions in all respects, as in the said recited act is mentioned in regard to highways to be widened and diverted; except that the money to arise from such sale, where by the said act it would be applicable to the purchase of the ground and soil of the new highways or bridleways therein mentioned, shall be paid to the surveyor or surveyors, and be applied towards the general repairs of the highways and bridleways of the parish, township, or place, within which the said highway, bridleway, or footway so stopped up shall be situate; provided that in the several cases before mentioned a notice, in a form prescribed, shall be affixed in legible characters at the place and by the side of the said highway, &c. from whence the same is directed to be turned, or stopped up, and also inserted in one or more newspaper or newspapers published or generally circulated in the county where the parish, township, or place in which the highway, &c. so ordered to be turned or stopped up (as the case may be) shall lie (or in case no such newspaper shall be so published, then in any newspaper or newspapers published or circulated in the nearest adjoining county,) for three successive weeks after the making of such order; and a like notice shall be affixed to the door of the church or chapel of every parish or township in which such highway, &c. shall lie, on three successive Sundays subsequent to the making of such order; and the said several notices having been so published, the said order shall at the Quarter Sessions which shall be holden within the limit where the highway, bridleway, or footway so diverted and turned or stopped up shall lie, next after the expiration of four weeks from the first day on which such notices shall have been published as aforesaid, be returned to the clerk of the peace in open court, and lodged with him; and the said order shall at such Quarter Sessions be confirmed, and by the clerk of the peace enrolled amongst the records of the said court.—55 Geo. III. c. 68. s. 2.

Provided always, that where any such highway, &c. shall be so ordered to be stopped up or inclosed, and such new highway, bridleway, or footway set out and appropriated in lieu thereof, or where any unnecessary highway, &c. shall be so ordered to be stopped up as aforesaid, any person or persons injured or aggrieved by any such order or proceeding, or by the inclosure of any road or highway, by virtue of any inquisition taken upon any writ of *ad quod damnum*, may make his or their complaint thereof by appeal to the justices of the peace at the said Quarter Sessions, upon giving ten days notice in writing of such appeal to the surveyor of the highways of the parish, &c. and also affixing such notice to the door of the church or chapel of such parish, &c.; and the said court of Quarter Sessions shall hear and finally determine such appeal.—*Ib.* s. 3.

If no such appeal be made, or, being made, such order and proceedings shall be confirmed by the said court, the said inclosures may be made, and the said ways stopped, and the proceedings thereupon shall be binding and conclusive to all persons whomsoever; and the new highways, bridleways, and footways so to be appropriated and set out shall be and for ever after continue a public highway, &c. to all intents and purposes; but no inclosures of such old highways, &c. (except in the case of stopping up of such useless highways, &c. as hereinbefore mentioned), shall be made until such new highway, &c. shall be completed

and put into good condition, and so certified by two justices of the peace upon view thereof; which certificate shall be returned to the clerk of the peace, and by him enrolled amongst the records of the court of Quarter Sessions next after such order as aforesaid shall have been confirmed or enrolled.—*Ib.* s. 4.

3. *Turnpike Roads.*

The acts for the general regulation of turnpike roads are six in number, as specified in the List of Acts, but the clauses of the first and third are very numerous and perplexed, so as to render it a difficult task to select those which appear of most particular importance to our readers—viz. relative to the powers to get materials, the construction, breadth and tire of wheels, the weight of carriages, the tolls for over-weight, the exemptions from tolls, the composition for tolls, the statute duty and other labour, the clipping of hedges, the removal of nuisances, the use of skid-pans, the marking of carriages, and the regulation of drivers:—

Power to get Materials.—It shall be lawful for the surveyor or surveyors to the trustees or commissioners of every turnpike-road, and for all such persons as he or they shall appoint to search for, dig, gather, take, and carry away any materials for making or repairing any turnpike-road out of any river or brook (not being within fifty yards of any bridge, dam, weir, or jetty), or out of or from any waste or common in any parish, hamlet, or place in which any part of such road may lie, or in any adjoining parish, hamlet, or place, and to haul and carry away such materials when got, over any common or waste lands, without paying anything for such materials, and without being deemed a trespasser or trespassers, the said surveyor or surveyors or other person or persons filling up the pits or quarries, levelling the grounds, or sloping down the banks wherefrom such materials shall be taken, or railing or fencing off such pits or quarries so that the same shall not be dangerous to any persons or cattle, and paying or tendering for the damage done by going through and over any inclosed lands or grounds for or with such materials, and such damages to be ascertained as herein after mentioned; and also it shall be lawful for the said surveyor or surveyors, and such person or persons as he or they shall appoint, to search for, dig, get, gather, take, and carry away any such materials in or out of the land of any person or persons where the same may be had or found in any parish, hamlet, or place in which any part of such road shall lie or be situate, or in any adjoining parish, hamlet, or place (not being a garden, yard, paddock, planted walk, or avenue to any house, or any piece of ground planted or set apart as a nursery for trees), making or tendering such satisfaction for such materials, and for the damage done to the owners or occupiers of the lands where and from whence the same shall be dug, gathered, and carried away, or over which the same shall be carried, as the said trustees or commissioners shall judge reasonable; and also to land on and carry through or over any inclosed lands or grounds (not being a garden, yard, paddock, planted walk, or avenue to a house, or any piece of ground planted and set apart as a nursery for trees), or on, through, or over any open land or common, any stone or other materials for making or repairing any such road, or for building or repairing any present or future toll-house or toll-houses on or by the sides thereof, from any river, stream, or canal in any parish, hamlet, or place in which any such road lies, or in any adjoining parish, hamlet, or place, paying or tendering for the damage done in landing on going through or over any inclosed lands or grounds for or with such materials, such sum or sums of money as the said trustees shall judge reasonable; and in case of any difference between such trustees or commissioners, surveyors, or other persons appointed or employed as aforesaid, and the owners or occupiers of such lands or any of them concerning such payments and damages, any two or more justices of the peace for the county, riding, or place, wherein the place from whence such materials shall have been aken shall be situate, on ten days' notice thereof being given in writing by either party to the other, shall hear, settle, and determine the matter of such payments and damages, and the costs of hearing and determining the same.—3 Geo. IV. c. 126. s. 97.

Provided always, that the said trustees shall not be required to pay any larger sum as a satisfaction for any materials raised, taken, or carried away from any lands or grounds for making or repairing any turnpike-road, than such sum of money as it shall appear to the two justices settling and determining such satisfaction that such materials might or could have been actually sold for, in case the same had not been raised, taken, or carried away by such trustees; and in case the said justices shall be of opinion that the same materials, before they had been so raised, taken, or carried away, could not have been sold or disposed of, then the said justices shall only assess the damage done to the lands or grounds of the owners or occupiers thereof, by the raising, gathering, or carrying away the same.—7 & 8 Geo. IV. c. 24. s. 15.

It shall not be lawful for any surveyor, or any other person or persons acting under the authority of this act, to dig, gather, get, take, or carry away any materials for making or repairing any turnpike-road, or for such other purpose or purposes as aforesaid, out of or from any inclosed land or ground, until notice in writing, signed by the surveyor, shall have been given to the owner or owners of the premises from which such materials are intended to be taken, or his or her known agent, or to the occupiers of the premises from which such materials are intended to be taken or left at the house, or last or usual place of abode

of such owner or occupier, to appear before any two or more justices of the peace acting in and for the county, liberty, or place, where the lands from whence such materials are intended to be taken shall lie, to shew cause why such materials shall not be had therefrom; and in case such owner, agent, or occupier, shall attend pursuant to such notice, but shall not shew sufficient cause to the contrary, such justices shall, if they think proper, authorise such surveyor or other person to dig, get, gather, take, and carry away such materials at such time or times as to such justices shall seem proper; and if such owner, agent or occupier shall neglect or refuse to appear by himself or herself, or his or her agent, the said justices shall and may (upon proof on oath of the service of such notice, and which oath they are hereby empowered to administer) make such order therein as they shall think fit, as fully and effectually to all intents and purposes, as if such owner or occupier, or his or her agent, had attended.—3 Geo. IV. c. 126. s. 98.

If any surveyor of any turnpike-road, or any person employed by him, shall, by reason of searching for, digging, or getting any gravel, sand, stones, chalk, clay, or other materials, for repairing any highways, make, or cause to be made, any pit or hole, in any common or other lands, or grounds, rivers, or brooks, as aforesaid, wherein such materials shall be found, the said surveyor shall forthwith cause the same to be fenced off, and such fence supported and repaired during such time as the said pit or hole shall continue open; and shall within three days after such pit or hole shall be opened or made, where no gravel, stones or materials shall be found, cause the same forthwith to be filled up, levelled, and covered with the turf or clod which was dug out of the same; and where any such materials shall be found, within fourteen days after having dug up sufficient materials, if the same is not likely to be further useful, cause the same to be filled up, sloped down, or fenced off, and if the same is likely to be further useful, the said surveyor shall secure the same by posts and rails, to prevent accidents; and in case of neglect to fill up, slope down, or fence off such pit or hole in the manner and within the time aforesaid, he or they shall forfeit 20*s*. for every such default; and in case of neglect to fence off such pit or hole, or to slope down the same, as hereinbefore directed, for the space of six days after he or they shall have received notice for either of those purposes from any justice of the peace, or from the owner or occupier of such several grounds, &c. or any person having right of common within such common or waste lands, as aforesaid, and such neglect and notice shall be proved upon oath before one or more justices of the peace, such surveyor shall forfeit and pay any sum not exceeding 10*l*. nor less than 40*s*. for every such neglect, to be determined and adjudged by such justice or justices, and to be laid out and applied in the fencing off, &c. such pit or hole in such manner as the said justice or justices shall direct and appoint; which forfeiture, in case the same be not forthwith paid, shall be levied as other forfeitures are hereinafter directed.—3 Geo. IV. c. 126. s. 99.

It shall be lawful for the said trustees or commissioners to contract and agree with any person or persons whomsoever for the purchase or demise from him, her, or them, of, and to hold any land or ground for the purpose of digging any stones, gravel, and materials therefrom, for the repair or use of the said road, and at any time afterwards to sell the land or ground so purchased, by public auction or tender; provided also, that the entering into any such contract or agreement as last aforesaid shall not be compulsory against any person or persons unwilling to enter into the same.—3 Geo. IV. c. 126. s. 100.

If any person or persons shall take away any materials which shall have been gotten, dug, or gathered, for the repair or use of any turnpike-road, or any materials out of any quarry which shall have been made, dug, or opened, for the purpose of getting materials for any turnpike-road; before the surveyor of such road, and the workmen employed for getting such materials shall have discontinued working therein for the space of six weeks (except the owner or occupier of any private grounds, and persons authorized by such owner or occupier, to get materials from such quarry for his own private use and not for sale), every person so offending shall, for every such offence, forfeit and pay any sum not exceeding 5*l*.—*Ib*. s. 101.

The trustees or commissioners of every turnpike-road are hereby empowered to purchase or rent any piece or pieces of land or ground, not exceeding in any one place six yards square, on the sides of such roads, as repositories for such stone, gravel, and other materials, for making and repairing the same; and in case any difference shall arise between any such trustees or commissioners and the owner of such land or ground, with respect to the value thereof, or the necessity or propriety of taking such land or ground, the same shall be settled and determined by any two of his Majesty's justices of the peace, acting in the county where the said land or ground shall be situated, in manner hereinbefore directed, with respect to getting materials for the repair of any turnpike-road.—*Ib*. s. 102.

Construction of, and breadth and tire of Wheels.—The several nails of the tire of any wheel of any waggon, cart, or other such carriage, shall be so countersunk as not to project beyond one quarter of an inch above any part of the surface of such tires; and if any waggon, cart, or other such carriage, shall, after the 1st day of January, 1826, be drawn or used on any turnpike-road, with any wheels otherwise than as hereinbefore last described, the owner shall forfeit not exceeding 40*s*., and every driver thereof, not exceeding 20*s*., for every time such waggon, cart, or other such carriage shall be used or drawn on any turnpike-road.—4 Geo. IV. c. 95. s. 2.

And where the trustees or commissioners of any turnpike-road shall not, previously to the passing of the act of 3 Geo. IV., have taken and collected on the road under their care the additional tolls on waggons, wains, carts, or carriages, having the wheels thereof of less breadth or gauge than six inches from side to side, at the bottom or sole thereof, and on the horses or beasts drawing the same, directed to be taken and collected by 13 Geo. III. c. 84, and the local acts shall not have provided a scale of tolls applicable to the road under their care; such trustees or commissioners shall continue to take, collect, and receive, for every waggon, wain, cart, or other such carriage, having the fellies of the wheels thereof of less breadth or gauge than four and a half inches from side to side, at the bottom or sole thereof, or for the horses or beasts drawing the same, the same tolls as are, in and by such local acts, payable in respect of such carriages; and for every waggon, wain, cart, or other such carriage, having the fellies of the wheels thereof of the breadth or gauge of four and a half inches, and less than six inches at the bottoms or soles thereof, or for the horses or beasts drawing the same, one-sixth less than the tolls which are payable for the same; and for every waggon, &c. having the fellies of the wheels thereof of the breadth of six inches or upwards, at the bottoms or soles thereof, or for the horses drawing the same, one-third less than the tolls which shall be payable for the same by any act or acts.—4 Geo. IV. c. 95. s. 5.

And no person shall, by virtue of the act, 3 Geo. IV. or any other act, have the benefit of any exemption from toll or penalties for overweight, or pay less toll for any waggon, wain, cart, or other carriage, or the horses or beasts drawing the same, and carrying any particular kind of goods, than other carriages of the like nature, carrying other goods, ought to pay, unless such waggon, wain, cart, or other carriage, shall have the sole of the bottom of the fellies of the wheels thereof of the breadth or gauge of four and a half inches (other than carts and carriages employed in carrying corn or grain in the straw, hay, straw, fodder, dung, or lime, for the improvement of the land or other manure, or any plough, harrow, or implements of husbandry only), but that the tolls imposed by any act, together with the additional tolls required to be taken for every such waggon, wain, cart, or other such carriage, having the sole or bottom of the fellies of the wheels thereof of less breadth or gauge than four and a half inches as aforesaid, and for horses or beasts drawing the same, and the additional tolls or penalties for overweight (except as before excepted) shall be paid in the same manner as if no exemption or less toll had been allowed, and as fully as all other carriages and horses drawing the same ought to pay, which are not entitled to any exemption, or to pay a less toll than any other carriages.—4 Geo. IV. c. 95. s. 10.

The trustees or commissioners appointed by virtue or under the authority of any act made or to be made, for making or maintaining any turnpike road, shall demand and take, or cause to be demanded and taken, for every waggon, wain, cart, or other such carriage, having the fellies of the wheels thereof of less breadth than four and a half inches at the bottom or soles thereof, or for the horse or horses or cattle drawing the same, one-half more than the tolls which are or shall be payable for any carriage of the same description, having the wheels thereof of the breadth of six inches; and for every waggon, wain, cart, or other such carriage, having the fellies of the wheels thereof of the breadth of four and a half inches, and less than six inches at the bottom or soles thereof; or for the horse or horses or other cattle drawing the same, one-fourth more than the tolls or duties which are or shall be payable on any carriage of the like description having the wheels thereof the breadth of six inches, by any act now in force, or hereafter to be passed for making or maintaining any turnpike road, before any such waggon, wain, cart, or other such carriage respectively, shall be permitted to pass through any turnpike-gate or gates, bar or bars, where tolls shall be payable, by virtue of any such acts.—3 Geo. IV. c. 126. s. 7.

Where any particular act or acts shall direct a higher or lower rate of toll to be collected and taken, regulated by, or in respect of the greater or lesser breadth of the wheels; and where, in addition to the tolls received under such particular act or acts, the additional tolls in respect of the breadth of wheels authorized to be taken by the act 13 Geo. III. c. 84, shall not have been collected and imposed, it shall be lawful for the trustees or commissioners acting in execution of any such particular act or acts, to continue to collect the tolls directed to be taken under the powers of such act or acts; and they shall not impose the additional tolls authorized by the said act of 3 Geo. IV., on waggons, wains, carts, or other such carriages, having the fellies of the wheels thereof of less breadth than six inches.—4 Geo IV. c. 95. s. 6.

Where any waggon or cart shall have the sole or bottom of the wheels thereof rolling on a flat surface, and the nails of the tire of such wheels countersunk, and be cylindrical; (that is to say, of the same diameter on the inside next the carriage as on the outside, so that when such wheels shall be rolling on a flat or level surface, the whole breadth thereof shall bear equally on such flat or level surface,) and shall have the opposite ends of the axletrees of such waggon, cart, or other carriage, so far as the same shall be inserted into the respective naves of the wheels thereof, horizontal, and in the continuance of one straight line, without forming any angle with each other; and in each pair of wheels belonging to such carriage, the lower parts when resting on the ground shall be at the same distance from each other as the upper parts of such wheels, it shall and may be lawful for the trustees or commissioners of any turnpike-road, at a general meeting, if they shall

think fit so to do, to make an order for every such waggon and cart to pass through any toll-gate or bar, under the superintendence of the trustees or commissioners making such order, upon paying only so much of the tolls and duties as shall not be less than two-thirds of the full toll or duty payable by any turnpike act on such waggon, cart, or other carriage, and the horse or horses or cattle drawing the same.—3 Geo. IV. c. 126. s. 9.

Nothing in the act of 3 Geo. IV., or this act, relating to the breadth of wheels, or to the regulations of weight, or to the tolls payable in respect of the wheels or of the weight of carriages, shall extend to any chaise, marine-coach, landau, barouche, phaeton, sociable, chariot, calash, hearse, break chaise, curricle, gig, chair, or taxed cart, or any cart not drawn by more than one horse or two oxen.—4 Geo. IV. c. 95. s. 19.

It shall be lawful for any trustee or commissioner of any turnpike-road, and for every collector, or his deputy, or other person acting by, or under the authority of, the trustees or commissioners of any turnpike-road, or of their lessee of tolls, to measure and examine, or cause to be measured and examined, the breadth and construction of the wheels of every waggon, cart, or other such carriage passing on such turnpike-road: such measurement and examination to take place, if the trustee, commissioner, or other authorized person making the same, shall so require, previously to such waggon, cart, or other carriage being allowed to pass through any toll-gate or bar, at which toll shall be payable; and if any owner or driver of any such waggon, cart, or other carriage, shall turn or drive out of the road in order to avoid or evade the measuring of the wheels of such waggon, cart, or other carriage; or if any such owner, driver, or any other person, shall refuse to allow the wheels of any such waggon, cart, or other carriage, to be measured, and the construction thereof examined, or shall attempt to pass through any toll-gate or bar before such measurement and examination shall be made, (the same having been required,) or shall in any way hinder or obstruct any such trustee or commissioner, or other authorized person, in making such measurement and examination, every such owner, driver, or other person so misbehaving, shall, for every such offence, forfeit any sum not exceeding 5*l.*; and it shall not be lawful for any such waggon, cart, or other carriage, not permitted to be measured or examined as aforesaid, to pass along any turnpike-road; and if any collector or his deputy, or any other person appointed to collect the tolls, shall allow the same to pass before such measurement and examination shall be made, (the same having been required,) every collector, deputy, or other person, shall, for every offence, forfeit any sum not exceeding 5*l.*—3 Geo. IV. c. 126. s. 11.

Weights of Carriages.—The weights hereafter next specified shall be allowed to every waggon, wain, cart, or other such carriage, (that is to say) to every waggon, wain, or four-wheeled carriage, having the fellies of the wheels thereof of the breadth of nine inches at the bottom or soles thereof, together with the loading of such carriage, six ton ten hundred-weight in summer, and six ton in winter; to every cart, or other such two-wheeled carriage, having the fellies of the wheels thereof of the like breadth, together with the loading of such carriage, three ton ten hundred-weight in summer, and three ton in winter; to every waggon, wain, or other such four-wheeled carriage, having the fellies of the wheels thereof of the breadth of six inches, and less than nine inches at the bottom or soles thereof, together with the loading of such carriage, four ton fifteen hundred-weight in summer, and four ton five hundred-weight in winter; to every cart, or other such two-wheeled carriage, having the fellies of the wheels of the breadth last mentioned, at the bottom or soles thereof, together with the loading of such last mentioned carriage, three ton in summer, and two ton fifteen hundred-weight in winter; to every waggon, wain, or other such four-wheeled carriage, having the fellies of the wheels thereof of the breadth of four and a half, and less than six inches at the bottom or soles thereof, together with the loading of such carriage, four ton five hundred-weight in summer, and three ton fifteen hundred-weight in winter; to every cart, or other such two-wheeled carriage, having the fellies of the wheels thereof of the breadth last mentioned, at the bottom or soles thereof, together with the loading of such carriage, two ton twelve hundred-weight in summer, and two ton seven hundred-weight in winter; to every waggon, wain, or other such four-wheeled carriage, having the fellies of the wheels thereof of a less breadth than four inches and a half at the bottom or soles thereof, together with the loading of such carriage, three ton fifteen hundred-weight in summer, and three ton five hundred-weight in winter; to every cart, or other such two-wheeled carriage, having the fellies of the wheels thereof of the breadth last mentioned, together with the loading of such carriage, one ton fifteen hundred-weight in summer, and one ton ten hundred-weight in winter; and, for the several purposes of this act, it shall be deemed summer from the 1st day of May to the 31st day of October, both days inclusive, and winter from the 1st day of November to the 30th day of April, both days inclusive.—3 Geo. IV. c. 126. s. 12.

To every caravan, or other four-wheeled carriage used for the conveyance of goods, and built and constructed with springs, shall be allowed the weights following: that is to say, for every carriage, three ton fifteen hundred-weight in winter, and four ton five hundred-weight in summer.—s. 13.

The trustees or commissioners of any turnpike road are empowered and required to receive, take, and demand, over and above the tolls payable by any act or acts of parlia-

ment now in force, or hereafter to be passed, the following sums of money, as additional toll for every hundred-weight which any waggon, cart, or other such carriage, together with the loading thereof, shall weigh, at any weighing engine, over and above the weights hereinbefore allowed to each of them respectively: that is to say, for the first and second hundred of such overweight, the sum of 3*d.* for each hundred; and for every hundred of such overweight above two hundred, and not exceeding five hundred, the sum of 6*d.*; for every hundred of such overweight above five hundred, and not exceeding ten hundred, the sum of 2*s.* 6*d.*; and for every hundred of such overweight, exceeding ten hundred, the sum of 5*s.*; which said additional sums or tolls, made payable at any weighing engine, shall and may be levied in such manner as any other toll, payable on the road on which any such weighing engine shall be erected.—3 Geo. IV. c. 126. s. 15.

And in case where any exemption from toll shall be claimed or allowed, under 3 Geo. IV. or this act, or any other act or acts, such exemption shall not extend to, or be allowed for, the additional tolls imposed by the said act, and directed to be taken for every hundred-weight which any waggon, cart, or other such carriage, together with the loading thereof, shall weigh, at any weighing engine, over and above the weights allowed to each of them, unless the waggon, wain, cart, or other such carriage, in respect of which the exemption shall be claimed, shall likewise be, by the said act, or this or some other act or acts, specially exempted from such additional tolls for overweight; but in all cases, (where not specially exempted,) the said additional tolls shall be paid, and only the original toll allowed.—4 Geo. IV. c. 95. s. 17.

The regulations of weights shall not extend to any waggons, carts, or other carriages, carrying only manure or lime for the improvement of the land, or any hay, straw, fodder, or corn unthrashed, except hay, straw, fodder, or corn, carried for sale; nor to any waggons, carts, or other carriages, carrying only one tree or one log of timber, or one block of stone, or one cable or rope, or only one block, plate, roll, or vessel of iron or other metal, or compounded of any two or more metals, cast, wrought, or united in one piece.—3 Geo. IV. c. 126. s. 16, and 4 Geo. IV. c. 95. s. 21.

If any person shall unload, or cause to be unloaded, any goods, wares, or merchandise, from any cart, waggon, or other carriage, at or before the same shall come to any turnpike-gate or weighing-engine, erected by virtue, or in pursuance of this or any other act, made for the repair or preservation of any turnpike-road, or shall load or lay upon such carriage, after the same shall have passed any such turnpike or weighing-engine, any goods, wares, or merchandise, taken or unloaded from any horse, cart, or other carriage, belonging to, or hired or borrowed by the same waggoner or carrier, in order to avoid the payment of the said respective duties payable for overweight; or if any person shall so unload, in order to carry considerable quantities of goods through any turnpike-gate, or by any weighing-engine, in one and the same day, and thereby pay less toll at such turnpike-gate or weighing-engine than would have been paid if such goods, wares or merchandise had not been so unladen; or if any driver of any waggon or cart shall not wait a reasonable time, whilst any other carriage shall be weighed which shall have come to the weighing-engine before the carriage of which he shall be the driver; or if the driver of any waggon or cart refuse, or delay to remove or drive any such waggon or cart from any such weighing machine, in order by such neglect or refusal to impede or delay the weighing of any other waggon or cart, or shall turn or drive out of any road, in order to avoid the weighing of any waggon or cart, each and every person so offending in any of the cases aforesaid, and being thereof lawfully convicted before one or more justice or justices of the peace for the limit where the offence shall be committed, upon the oath of one or more credible witness or witnesses, shall forfeit the sum of 5*l.*, to be levied upon the goods and chattels of the owner of such cart, waggon, or other carriage, and each and every driver, not being the owner of such waggon or carriage, so offending, and being thereof convicted as aforesaid, shall forfeit any sum not exceeding 40*s.*; and in case of non-payment thereof, shall be committed to the house of correction for any time not exceeding two calendar months.—3 Geo. IV. c. 126. s. 20.

Where weighing engines are erected, if the owner or driver of any waggon, cart, or other carriage, shall refuse to allow the same to be weighed, or shall resist any gate-keeper or toll-collector in weighing the same, every owner or driver so offending shall forfeit any sum not exceeding 5*l.*—3 Geo. IV. c. 126. s. 22.

And in order to detect the said collector or receiver of tolls in any fraudulent contrivance or neglect of duty, any trustee, or commissioner, or surveyor, of every turnpike-road, if he shall suspect any such contrivance or neglect, may cause any waggon, cart, or other carriage, which shall have passed through any toll-gate where any weighing-engine shall be erected, and shall not have passed beyond three hundred yards beyond such toll-gate, to return to such weighing-engine, and there be weighed with the loading which passed through such toll-gate, in the presence of such trustee, or commissioner, or surveyor, upon requiring the driver thereof to drive such carriage back to such weighing-engine, and upon paying or tendering to him the sum of 1*s.* for so doing, which sum of 1*s.* shall be returned to the person paying the same, if upon weighing such carriage and the loading thereof, it shall be found above the weight allowed.—3 Geo. IV. c. 126. s. 23.

If the driver of any such carriage, being requested to return with his carriage to such

weighing-engine, shall neglect or refuse so to do, he shall forfeit any sum not exceeding 5*l.*; and it shall and may be lawful for any peace officer, or other person or persons being then present, upon such neglect or refusal, to drive and take such carriage back to such weighing machine, in order to be weighed.—3 Geo. IV. c. 126. s. 24.

Exemptions from Toll.—In every case in which, under any act or acts of Parliament relating to any turnpike-road, there is an exemption from toll or duty in respect of any horse, mule, ass, ox, waggon, cart, or other carriage drawing or carrying any dung, mould, marl, or compost of any nature or kind soever, for improving or manuring the land, or hay, straw, or other fodder for cattle, or materials for repairing any turnpike roads or highways, such exemption shall be deemed to extend in respect of every such waggon, cart, or other carriage, and also in respect to the cattle drawing the same going empty or loaded only with implements necessary for more convenient carriage or loading or unloading such lading, or returning empty or with such implements as aforesaid, having been so laden, notwithstanding the said waggon, cart, or other carriage shall, for the purpose aforesaid, go to or return from any parish or place in which the said turnpike does not lie.—3 Geo. IV. c. 126. s. 26.

The owner or driver of every waggon, cart, or other carriage, passing empty or loaded only with implements necessary for the more convenient carriage of, or for loading or unloading manure or materials for the repair of any turnpike-road or highway, and claiming exemption from toll, under pretence of going for such manure or materials, shall in all cases pay the toll in respect of such waggon, cart, or carriage before the same shall be permitted to pass through any turnpike-gate, and the collector shall thereupon deliver to the owner or driver a ticket, to be marked "*Manure exemption*," or "*Road materials*," as the case may be, with the name of the gate and the date when delivered, and the amount of the toll so paid; all which sum or sums so paid shall be repaid to the owner or driver of such waggon, cart, or other carriage, upon his or their returning with such waggon, cart, or other carriage, so laden as aforesaid, and producing such ticket; and every collector of such toll refusing to give such ticket on receiving the toll, or refusing or neglecting to return the same toll upon the return of such waggon, cart, or other carriage so laden, and redelivery of the "*Manure exemption*" or "*Road materials*" ticket, as the case may be, shall for every such offence forfeit to the owner of such waggon, cart, or other carriage, a penalty of not more than 5*l.* upon conviction thereof before one or more justice or justices of the peace for the county, riding, division, or place where such offence shall be committed, upon the oath of one credible witness.—3 Geo. IV. c. 126. s. 27.

The owner or driver of any waggon, cart, or other carriage laden with manure for land, or materials for any turnpike-road or highway passing through any turnpike-gate, or otherwise passing on or across any turnpike-road, shall not be liable to pay any toll, nor shall any toll be demanded for such carriage so laden, or the cattle drawing the same, by reason only of any basket or baskets, empty sack or sacks, or spade, shovel, or fork necessary for loading or unloading such manure or materials, being in or upon any such waggon, cart, or other carriage in addition to such manure or materials, if the loading thereof is substantially manure for land or materials for repair of any turnpike-road or highway as aforesaid. 3 Geo. IV. c. 126. s. 28.

All horses travelling for hire under the post-horse duties acts, having passed through any turnpike-gate erected or to be erected on any turnpike-road, drawing any carriage in respect of which any toll shall have been paid, on returning through the turnpike-gate at which the toll shall have been paid, and the other gates (if any) cleared by such payment, either without such carriage or drawing such carriage, the same being empty and without a ticket denoting a fresh hiring, shall be permitted to repass toll-free, although such horses or carriage shall not have passed through such turnpike-gate on the same day, provided that such horses so travelling shall return before nine of the clock of the morning succeeding the day on which they first passed the turnpike-gate at which the toll shall have been paid. 3 Geo. IV. c. 126. s. 29.

Where any horse or horses shall pass through any turnpike-gate on any road not drawing any carriage, and a toll shall be paid on such horse or horses at such turnpike-gate, and the same horse or horses shall return drawing any carriage on the same day, or within eight hours after their first passing through such gate, the toll paid on such horse or horses on their originally passing shall be deducted from the toll payable on the same when drawing the carriage to which they shall be attached on their return, so that no higher toll shall, in the whole, be taken than if such horse or horses had in the first place passed through such turnpike-gate drawing the said carriage.—3 Geo. IV. c. 126. s. 30.

No toll shall be demanded or taken by virtue of this or any other act or acts of Parliament on any turnpike-road, for any horses or carriages attending (or going to attend*) or returning from attending his Majesty or any of the Royal Family, or of or from any person or persons for any horse or horses, or other beast or cattle, or for any waggon, wain, cart, or other carriage employed in carrying or conveying or going empty to fetch, carry, or convey, or returning empty from carrying or conveying, having been employed only in carrying or conveying on the same day any stones, bricks, timber, wood, gravel, or other mate-

* 4 Geo. IV. c. 95. s. 24.

rials for making or repairing any turnpike-road or publichighway, or for building, rebuilding, or repairing any present or any future bridge or bridges on any such road or public highway, or of or from the surveyor of any turnpike-road when engaged in executing or proceeding to execute within the limits of his own (or any adjoining*) trust, the powers of this or any other act or acts of Parliament for repairing, maintaining, or relating to any turnpike-road, or for any horse, beast, or other cattle or carriage employed in carrying or conveying, having been employed only in carrying or conveying on the same day, any dung, soil, compost, or manure (save and except lime†), for improving lands, or any ploughs, harrows, or implements of husbandry (unless laden also with some other thing not hereby exempted from toll), or any hay, straw, fodder for cattle, and corn in the straw which has grown or arisen on land or ground in the occupation of the owner of any such hay, straw, fodder, or corn in the straw, potatoes, or other agricultural produce, and which has not been bought, sold, or disposed of, nor is going to be sold or disposed of, or for any horses or other beasts employed in husbandry going to or returning from plough, harrow, or to or from pasture or watering-place, or going to be or returning from being shoed or farried, such horses or other beasts not going or returning on those occasions more than two miles on the turnpike-road on which the exemption shall be claimed; or of or from any person or persons going to or returning from his, her, or their proper parochial church or chapel, or of or from any other person or persons going to or returning from his, her, or their usual place of religious worship tolerated by law, on Sundays, or on any day on which divine service is by authority ordered to be celebrated, or of or from any inhabitant of any parish, township, or place, going to or returning from attending the funeral of any person who shall die and be buried in the parish, township, or hamlet, in which any turnpike-road shall lie; or from any rector, vicar, or curate going to or returning from visiting any sick parishioner, or on other his parochial duty within his parish, or for horses, carts, or waggons employed only in carrying or conveying any vagrant sent by a legal pass, or any prisoner sent by any legal warrant, or returning empty after being so employed, or for any horses or carriages, of whatever description, employed or to be employed in conveying the mails of letters, and expresses, under the authority of his Majesty's Postmaster-general, either when employed in conveying, fetching, or guarding such mails or expresses, or in returning back from conveying or guarding the same, or for the horse or horses of any officers or soldiers on their march or on duty, or for any horse or horses or other beast, or any cart, carriage, or waggon employed in carrying or conveying, or returning empty from carrying or conveying, having been employed only in carrying and conveying the arms or baggage of any such officers or soldiers, or employed in carrying or conveying or returning empty from having been employed only in carrying or conveying any sick, wounded, or disabled officers or soldiers, or for any waggon, wain, cart, or other carriage whatsoever, or the horse or horses, or other cattle drawing the same, employed in conveying any ordnance, or barrack, or commissariat, or other public stores of or belonging to his Majesty, or for the use of his Majesty's forces, or returning empty from having been so employed, or for any carriage conveying volunteer infantry, or for any horse furnished by or for any person belonging to any corps of volunteer cavalry, or yeomanry, or infantry, and rode by him in going to or returning from any place appointed for and on the days of exercise, inspection, or review, or on other public duty, provided that such person shall be dressed in the uniform of his corps, and shall have his arms, furniture, and accoutrements according to the regulations of such corps at the time of claiming such exemption; or for any horses or carriages carrying or conveying any person or persons to or from any election or elections of a knight or knights of the shire to serve in Parliament for the county or counties in which such turnpike-road shall be situated, or for any horses or carriages which shall only cross any turnpike-road, or shall not pass above one hundred yards thereon.—3 Geo. IV. c. 126. s. 32.

Nothing in the act 3 Geo. IV., or this act, shall extend to exempt any waggon, wain, cart, or other carriage laden with dung, compost, or manure for manuring land; or any horse or other beast drawing the same from any toll imposed in respect thereof by any local act or acts wherein such act or acts such dung, compost, or manure shall be specially made subject to toll throughout the whole of such roads, without any local, parochial, or partial exemption.—4 Geo. IV. c. 95. s. 23.

And nothing in either of the said acts shall extend to repeal or take away any exemptions from toll which shall have been granted or allowed by any local act.—4 Geo. IV. c. 95. s. 26.

No person owning or driving any waggon, wain, cart, or other carriage, provided for the service of his Majesty's forces, or conveying any ordnance, or barrack, or commissariat, or other public stores of or belonging to his Majesty, or for the use of his Majesty's forces, shall be subject to any additional toll, penalty, or forfeiture for overweight; nor shall any such waggon, wain, cart, or other carriage, or the horse or horses drawing the same, while so employed, be stopped or detained by reason of any weight in any such waggon, wain, cart,

* These words repealed by 4 Geo. IV. c. 95. s. 25.

† By 4 Geo. IV. c. 16. lime for improving land not to be charged if exempted by the local acts.

or other carriage, or of being drawn by any number of horses or oxen; but it shall be lawful for the owner or driver of any such waggon, wain, cart, or other carriage, to put any number of horses or oxen to such waggon, wain, cart, or other carriage.—3 Geo. IV. c. 126. s. 35. And see 4 Geo. IV. c. 95. s. 10 *ante*.

If any person or persons shall, by any fraudulent or collusive means whatsoever, claim or take the benefit of any exemption from toll or overweight, or for using any additional horse or horses, or of any other exemption or exemptions whatsoever in this act * contained, every such person shall, for every such offence, forfeit any sum not exceeding 5*l.*; and, in all cases, the proof of exemption shall be upon the person claiming the same.—3 Geo. IV. c. 126. s. 36.

Where by any local act no toll is directed to be taken for any carriage with four wheels passing through any turnpike-gate, tied or secured to any waggon or cart, the same toll shall be taken for and in respect of such coach, chariot, chaise, or other carriage, as if the same had passed through drawn by two horses; and where by any such act no toll is directed to be taken for any carriage with two wheels only, so tied or secured, the same toll shall be taken for such last mentioned carriage, as if the same had passed through drawn by one horse only; and where any horse shall be fastened to, but not used in drawing any waggon, cart, or other carriage, such horse shall not be liable to a higher toll than a single horse: provided, that if any carriage so tied or secured shall have any goods conveyed therein, other than the harness thereto belonging, and such articles of package as may be necessary for the protection of such carriages, the same shall be liable to double such toll.—3 Geo. IV. c. 126. s. 31.

In all carriages wherein oxen or neat cattle shall be used, two oxen or neat cattle shall be considered as one horse for all the purposes mentioned in this act, or any particular turnpike act, with respect to tolls or other things.—3 Geo. IV. c. 126. s. 38.

Trustees shall put up a table of tolls at each gate in legible letters, and provide tickets to be delivered to persons paying toll, in order to enable them to pass through any other gates, where they ought to pass without further payment.—3 Geo. IV. c. 126. s. 37. and 4 Geo. IV. c. 95. s. 28.

If any person, subject or liable to the payment of any of the toll or tolls under, and by virtue of this or any other act of Parliament, for making, repairing, or maintaining any turnpike-road, shall, after demand thereof made, neglect or refuse to pay the same, or any part or parts thereof, it shall be lawful for the person or persons authorised or appointed to collect such tolls, by himself or themselves, or taking such assistance as he or they shall think necessary to seize and distrain any horse, beast, cattle, or carriage, or other thing, upon or in respect of which any such toll is imposed, together with their respective bridles, saddles, gears, harness, or accoutrements (except the bridle or reins of any horse or other beast separate from the horse or beast), or any carriage in respect of the horses or cattle drawing the carriage on which such toll is imposed, or any of the goods or chattels of the person or persons so neglecting or refusing to pay; and if the toll, or any part thereof, so neglected or refused to be paid, and the reasonable charges of such seizure, and distress, shall not be paid within the space of four days next after such seizure and distress made, the person or persons so seizing and distraining may sell the horse, beast, cattle, carriages, or things so seized and distrained, or a sufficient part thereof, returning the overplus of the money to arise by such sale (if any), and what shall remain unsold, upon demand to the owner thereof, after such tolls and the reasonable charges occasioned by such seizure, distress, and sale, shall be deducted.—3 Geo. IV. c. 126. s. 39.

If any dispute shall happen to arise about the amount of the tolls due, or the charges of making, keeping, or selling any distress, made for non-payment of any tolls, it shall be lawful for the collector or the person distraining to retain such distress, or the money arising from the sale thereof (as the case may be), until the amount of the tolls due, and the charges of making, keeping and selling the distress be ascertained by some justice of the peace for the county, division or place wherein the turnpike or toll-gate, at which the toll in dispute shall be payable, shall or may be situate, who, upon application made to him for that purpose, shall examine the matter upon the oath of the parties or other witness or witnesses (which oath such justice is hereby authorized and empowered to administer), and shall determine the amount of the tolls due, and shall award such costs and charges to either party as to the said justice shall appear right and proper, all which costs and charges shall and may be levied and recovered in case of non-payment thereof forthwith by distress and sale of the goods and chattels of the person or persons so awarded or directed to pay the same, by warrant under the hand and seal of such justice, rendering the overplus (if any) upon demand, after deducting the costs and charges of making such distress and sale, to the person or persons whose goods and chattels shall have been so distrained and sold.—3 Geo. IV. c. 126. s. 40.

If any person shall, with any horse, cattle, beast, or carriage, go off or pass from any turnpike-road, through or over any land or ground near or adjoining thereto (not being a public highway, and such person not being the owner or occupier, or servant, or one of the family of the owner or occupier of such land or ground), with intent to evade the pay-

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* Or in any local act, 9 Geo. IV. c. 77. s. 17.

ment of the tolls granted by any act of Parliament; or if any owner or occupier of any such land or ground shall knowingly or willingly permit, or suffer any person (except as aforesaid), with any horse, cattle, beast, or carriage whatsoever, to go or pass through or over such land or ground, with intent to evade any such tolls; or if any person shall give or receive from any person other than the collectors of the tolls, or forge, counterfeit, or alter any note or ticket directed to be given, with intent to evade the payment of the tolls, or any part thereof; or if any person shall fraudulently or forcibly pass through such toll-gate with any horse, cattle, beast, or carriage; or shall leave upon the said road any horse, cattle, beast, or carriage whatsoever, by reason whereof the payment of any tolls or duties shall be avoided or lessened; or shall take off, or cause to be taken off, any horse or other beast or cattle from any carriage, either before or after having passed through any toll-gate; or, having passed through any toll-gate, shall afterwards add or put any horse or other beast to any such carriage, and draw therewith upon any part of any turnpike-road so as to increase the number of horses or other beasts drawing the said carriages, after the same shall have passed through any toll-gate, whereby the payment of all or any of the tolls shall or may be evaded; or if any person shall do any other act whatever, in order or with intent to evade the payment of all or any of the tolls, and whereby the same shall be evaded, every such person shall for every such offence forfeit any sum not exceeding 5*l*.—3 Geo. IV. c. 126. s. 41. [See also 4 Geo. IV. c. 95. s. 83, 84.]

And the trustees and commissioners of every turnpike-road may from time to time, as they shall see convenient, compound and agree for any term not exceeding one year at one time, with any person or persons, for the tolls payable for any horses, cattle, or beasts, or carriages, passing through any of the turnpikes or toll-gates of the road under their care and management.—4 Geo. IV. c. 95. s. 13.

Statute Duty.—All persons legally liable to do statute work, or to contribute to the repairs of any turnpike-road, shall remain liable thereto. Two justices, on application of the trustees or their surveyor, shall yearly determine what part of the statute work shall be done upon such road by the inhabitants of the respective parishes through which the same shall pass, and also what proportion of the money received as composition for statute-work shall be paid to the trustees of such road; for which purpose the surveyor of highways shall make a list of persons liable to do statute work, or to contribute to repairs, to be laid before the justices; and the justices shall, at a day appointed, appoint so many persons to do statute work, as they shall think reasonable, and at such times (except hay-time and harvest), and on such parts of the road as the said trustees shall appoint; and the justices shall also order the surveyor of highways to pay to the said trustees such proportion of the composition money as they think proper. Persons omitting to perform their assigned share of statute work shall be liable to the penalties imposed by the highway acts. Any person coming to work as a labourer, or being sent with any team or draught, and being found idle or negligent, may be dismissed by the surveyor to the trustees, and shall be subject to the same penalties as if he had not come. Penalty, not exceeding 10*l*., on any surveyor of highways who shall not give a list as required, or wilfully give a false or imperfect list, or shall not collect and pay over to the trustees the composition money assigned to them.—4 Geo. c. IV. 95. s. 80.

In parishes where no surveyor of highways is appointed, the churchwardens and overseers shall act in his stead, with respect to the preceding provisions.—4 Geo. IV. c. 95. s. 81.

The trustees of any turnpike-road may compound with any person for the repairs or statute work to be done by them, and also with the surveyor of highways in any parish, for the whole or any part of the statute or other work to be done on the said road, such composition to be paid at such times as shall be agreed upon.—3 Geo. IV. c. 126. s. 105.—4 Geo. IV. c. 95. s. 82.

When the state of repairs and revenues of any turnpike-road shall be such, that the full statute labour will not be required for such road, the justices may dispense with the whole or any part of it.—3 Geo. IV. c. 126. s. 109.

Making and Cleansing of Ditches.—Ditches, drains, or water courses, of a sufficient depth and breadth for the keeping all turnpike-roads dry, and conveying the water from the same, shall be made, scoured, cleansed, and kept open, and sufficient banks, tunnels, plats, or bridges, shall be made and laid where any carriageways or footways lead out of the said turnpike-roads into the lands adjoining thereto by the occupier of such lands; and every person who shall occupy any lands adjoining, or near such turnpike-road, through which the water hath used to pass from the said turnpike-road, shall and is required, upon every occasion, to open and cleanse the ditches, &c. for such water to pass without obstruction; and upon default, after ten days' notice when given, shall, for every offence, forfeit not exceeding 5*l*.—3 Geo. IV. c. 126. s. 113.

Removal of Nuisances.—The surveyor of every turnpike-road, or such person as he shall appoint, may remove and prevent all annoyances on every part thereof, by filth, dung, ashes, rubbish, &c., being laid or thrown thereon, or upon any open common or waste land within eighty feet from the centre thereof, and dispose of the same for the benefit of the said road, in case the owner shall neglect to remove the same within twelve hours after notice in writing, signed by any two trustees or the surveyor of such road, or in case the owner is

not known, then, after a like notice, affixed for three days on the nearest turnpike-gate; and may turn any watercourses, &c. running into and to the prejudice of the same road, and to open and cleanse them, and to make the same as deep and large as he shall think proper and necessary, in case the owners or occupiers of the adjoining lands shall neglect to do so after seven days' notice thereof in writing, given for that purpose, and the charges thereof and of removing any annoyances shall be settled by one or more justice of the peace, and recovered in the same manner as the penalties and forfeitures are by the said act thereinbefore directe dto be recovered; and if after removal of any such annoyances any person shall offend again, he shall, for every such offence, forfeit and pay any sum not exceeding 5*l*.—3 Geo. IV. c. 126. s. 114.

Drains, &c.—In all cases where any gutter, &c. made, or to be made, under, or at the sides, or near any turnpike-road, shall be used as well for the conveyance of water from such turnpike-road as for conveying water, &c. from the houses or premises of the inhabitants of any town, &c. and no specific mode of repair or persons liable to the expenses of maintaining the same shall be appointed, the expenses of repairing such gutter, &c. shall be defrayed equally or in proportions by the trustees or commissioners of such road and the inhabitants of the town, &c. using the same; and in order to ascertain the amount of the proportion and recover the expenses, the surveyor of the road shall do such works, and shall then make out an account of the expense thereof, and produce the same to two or more justices of the peace acting for the county or place where such gutter, &c. shall lie; and such justices are hereby authorized to examine the accounts and statements produced to them and to inquire as to the persons using such gutter, &c. and to proportion the respective amounts to be paid, as to them shall seem just and reasonable; and upon neglect or refusal to pay the sum directed by the said justices by any person, the same shall be levied by distress and sale of his goods, by a warrant under the hands and seals of any two or more justices of the peace acting for the said county or place where such person shall reside.—3 Geo. IV. c. 126. s. 115.

Clipping of Hedges.—The owners or occupiers of the land adjoining to every turnpike road, shall cut, prune, and trim their hedges to the height of six feet from the surface of the ground, and also cut down, prune, or lop, the branches of trees, &c. growing in or near such hedges, &c. adjacent thereto, (such fences, &c. not being in any garden, orchard, or plantation, walk, or avenue, to a house, nor any tree, &c. being an ornament or shelter to a house, unless the same shall hang over the road in such manner as to impede or annoy any carriage or person travelling thereon), in such manner as that the said turnpike-road shall not be prejudiced by the shade thereof, and the sun and wind may not be excluded therefrom to the damage thereof, and on neglect to do so after ten days' notice, it shall be lawful, and the surveyor is required, to make complaint thereof to some justice of the limit, who shall summon the occupier of such lands before him for the said complaint; and if it shall appear to such justice, that such occupier has not complied with the requisites of this act, it shall, and may be lawful, for such justice, upon hearing the surveyor and occupier of such land or his agent, (or in default of appearance upon having due proof of the service of such summons,) and considering the circumstances of the case, to order such hedges to be cut, &c. in such manner as may best answer the purposes aforesaid; and if the occupier of such lands shall not obey such order within ten days after it shall have been made, and he shall have had due notice thereof, he shall forfeit the sum of 2*s*. for every twenty-four feet in length of such hedge, and the sum of 2*d*. for every tree, &c. which shall be so directed to be cut down, &c.: And the surveyor, in case of default by the occupier, shall, and he is hereby required to, cut &c. such hedges, &c. in the manner directed by the said order, and such occupier shall be charged with, and pay, over and above the penalties, the expenses of doing the same, or in default, such charges and expenses, together with the forfeitures, shall be levied on his goods, &c. by warrant, in such manner as directed for other forfeitures under the said act.—3 Geo. IV. c. 126. s. 116.

No person shall be compelled, nor any surveyor permitted, by virtue of this act, to cut or prune any hedge at any other time than between the last day of September and the last day of March.—*Ib.* s. 117.

Encroachments.—If any person shall make any dwelling-house or other building, or any hedge or fence on, or at the sides of, any turnpike-road, in such manner as to reduce the breadth or limits thereof, or shall fill up or obstruct any ditch at the side thereof, or shall make any dwelling-house, hedge, or fence, on any waste land on the sides of such road, within the distance of thirty feet, if within the distance of three miles of any market town, or if beyond that distance, within twenty-five feet from the centre thereof, or shall make any drain, &c. or otherwise break up the surface of such road, or shall plough, &c. or break up the soil of any land or ground, or in ploughing or harrowing the adjacent lands shall turn their plough or harrow in or upon any land within the distances aforesaid from the centre of such turnpike-road, or make any other encroachment on any turnpike-road within the distances aforesaid, every person so offending shall forfeit, for every offence, 40*s*. to such person who shall make information of the same: And it shall be lawful for the trustees of such road to cause such dwelling-houses or other encroachment to be taken down or filled up, or where any ditch shall be obstructed, to be opened or cleansed at the expense of the person or persons to whom the same shall belong: And it shall be lawful for any one or more justices of the peace of the county where such offence shall be committed, upon proof

thereof to him or them, made on oath, to levy the expenses attending the removing such encroachments, by distress and sale of the offender's goods, rendering the overplus (if any) to the owner on demand.—3 Geo IV. c. 126 s. 118.

Damage and Obstruction.—If any person shall ride upon any footpath or causeway by the side of any turnpike-road made or set apart for the accommodation of foot-passengers, or shall lead or drive any cattle or carriage, or any single wheel apart therefrom, upon such footpath or causeway, or shall cause any injury or damage to be done to the same,* or the hedges, &c. thereof, or shall wilfully pull down or damage any bridge, &c. made by the trustees or repairable by them, or shall haul or draw any timber, stone, or thing otherwise than upon wheeled carriages, or shall suffer any timber, &c. which shall be carried principally or in part upon wheeled carriages, to drag or haul upon such road to the prejudice thereof, or shall use any tipstick, joggle, or other instrument for the purpose of retarding the descent of any cart or carriage down any hill, in such manner as to destroy, injure, or disturb the surface of such turnpike-road, or shall, in or upon, or in any exposed situation near thereto, slaughter, &c. any beast or other cattle; or if any person driving any horse or pannier, or other matter or thing on the said road, carrying any iron bar, rod, or basket, &c. so that the same, or any of them, shall project more than thirty inches from the side of such horse or other beast, or so as to impede or obstruct the passage of any person, or any beast, &c. travelling along such turnpike-roads; or if any hawker, &c. travelling with any machine or carriage, with or without any horse, &c. shall pitch any tent, &c. or encamp upon or by the sides of any turnpike-road; or if any person occupying a blacksmith's shop situate near any turnpike-road, and having a window fronting such road, shall not, by good and close shutters, every evening after it becomes twilight, prevent the light of such shop from shining into and upon such road; or if any person shall make, or assist in making, any fire, or shall set off any firework whatsoever within eighty feet of the centre of such road, or bait any bull, or play at football, &c. or any other game upon such road, or in any exposed situation near thereto, to the annoyance of any passenger or passengers, or leave any waggon or other carriage whatever upon such road or the side thereof, without a proper person in the sole care thereof, longer than necessary for loading or unloading the same, except in cases of accident, and in cases of accident, for a longer time than may be necessary to remove the same, or shall not place such waggon or other carriage, during the time of loading or unloading the same, or taking refreshment, as near to one side of the road as conveniently may be, with or without any horse or beast of draught harnessed or yoked thereto; or shall lay any timber, stone, &c. upon the said road, or upon the sides thereof, or on the footways or paths adjoining, to the prejudice of such road or footways, or to the prejudice, annoyance, &c. of any person travelling thereon; or shall suffer any water, filth, &c. to run or flow into or upon such road or footpath from any house, &c. adjacent thereto; or if any person driving pigs or swine on the said road, shall suffer them to root up or damage such road, or the fences, &c.; or if any person shall, after having blocked or stopped any cart or other carriage in going up a hill, suffer to remain on the said road the stone or other thing with which such cart, &c. shall have been blocked; or if any person shall pull down, damage, or injure any lamp or lamp-post, put up or placed in or near the side of any turnpike-road, or toll house erected thereon, or shall extinguish the light of such lamp, any person so offending in any of the cases aforesaid shall for each and every such offence forfeit and pay any sum not exceeding 40*s* over and above the damages occasioned thereby.—3 Geo. IV. c. 126 s. 121. And when any damages are authorized to be recovered in addition to a penalty, the amount thereof shall be settled by the convicting justice, and levied in the same manner as the penalty.—4 Geo IV. c. 95 s. 69.

Cattle Straying.—If any horse, ass, sheep, swine, or other beast or cattle of any kind, shall at any time be found tethered, or wandering, straying, or lying about any turnpike-road, or across any part thereof (except on such parts as lead or pass through or over any common or waste or uninclosed ground), any surveyor of the road, or other person whomsoever may seize and impound every such horse, &c. in the common pound of the parish, &c., or in such other place as the trustees shall have provided for that purpose; and the said horse, &c. there to detain until the owner thereof shall for every horse, &c. so impounded, pay the sum of 2*s*., together with the charges of impounding and keeping the same, to the treasurer, clerk, or surveyor of the road, and in case the said penalty and expenses shall not be paid within five days after such impounding (notice being first given to the owner, if known, and if not known then by written notices on the two next toll-gates), any justice may order every such horse, &c. to be sold, except where it shall be made appear to such justice, that the horse, &c. escaped from any inclosure by any gate or fence being wilfully or negligently left open by any person not the owner or occupier thereof: and the money arising after such sale, after deducting the said penalty and expenses as aforesaid, shall be paid to the person whose property the same so sold shall appear to have been; and in case the owner shall not be known, and the money remain unclaimed for twenty-one days after sale, the produce shall be applied for the use of the road. Provided that no owner of any horses, &c. impounded shall in any one case pay more than 5*l*. besides the expenses of impounding and keeping; and that nothing herein contained

* See also 7 and 8 Geo. IV. c. 24. s. 16.

shall be deemed to take away any right of pasturage on the sides of any road.—4 Geo. IV. c. 95. s. 75.

In case any person shall release, or attempt to release any cow, horse, &c. which shall have been seized for the purpose of being impounded, or shall pull down, damage, or destroy the pound or place, or any part thereof, or any lock or bolt belonging thereto, or shall rescue, or attempt to rescue or release any distress or levy which shall be made, until or before any such horse, &c. seized or so impounded, or such distress or levy made shall be discharged by due course of law, every person so offending shall, on conviction before a justice, upon confession or upon the oath of one witness, be committed to gaol not exceeding three calendar months.—3 Geo. IV. c. 126. s. 123.

Where in any act relating to turnpike-roads any thing is forbidden or directed to be done within a certain distance of the centre of the road, that portion of the ground shall be deemed to be the road which has been maintained by the trustees, &c. as hard road for six months immediately preceding any offence committed against such regulations; and the centre of the road shall be the middle of such hard road. Provided always, that nothing herein shall authorize any person to inclose or make incroachments on any waste land lying on the side of any turnpike-road being part of the highway.—3 Geo. IV. c. 126. s. 124.

Gates to open inwards.—No door or gate of any building, park, paddock, field, or inclosure whatsoever, shall be made to open into any turnpike-road or the footpath belonging thereto, or be suffered to continue so to open, except the hanging-post thereof shall be fixed so far from the centre of any such turnpike-road as that no part of such door or gate shall when open project over any part of such turnpike-road, or the footpaths belonging thereto; and the occupier of any building, park, &c., having any door, &c., opening outwards, contrary to this Act, shall, within fourteen days after notice given, either personally or in writing, from the surveyor of any turnpike-road, cause the same to be hung so that no part thereof when open shall project over any part of such road or footpath: and upon default the surveyor shall cause the same to be done, and the person guilty of such neglect upon complaint made to any justice acting in and for the county where such neglect shall appear, and upon conviction on the oath of one credible witness, pay to such surveyor such sum as the justice shall direct to defray the expense of such alteration, and also forfeit a further sum not exceeding 40*s.* for his neglect therein, to be fixed by the justice before whom such conviction shall take place.—3 Geo. IV. c. 126. s. 125.

Use of Skid Pans.—The trustees, &c., of every turnpike-road, at any meeting to be held for that purpose (on ten days' notice in writing of such meeting being affixed upon the turnpike-gates on the road) may order that, in all cases where any waggon or cart shall descend any hill on the said road, with either of the wheels locked, a skid pan or slipper shall be used and placed at the bottom of such wheel, during the whole time of its being so locked, in such manner as to prevent injury to the said road, by the locking of such wheel; and such trustees, &c., may repeal, alter, or renew such order as they shall think necessary; and whilst any such order shall be in force, every person acting as the driver of any waggon or cart down any hill, and not obeying the same order, shall, for every such offence, forfeit any sum not exceeding 20*s.* Provided always that a copy of such order shall be affixed on all the turnpikes standing on the said road, for thirty days at least before the same shall be in force.—*Ib.* s. 126.

Windmills.—No windmill shall be erected within two hundred yards of any turnpike-road, under a penalty of 5*l.* per day, so long as it shall be continued.—*Ib.* s. 127.

Marking of Carriages.—The owner of every waggon, wain, cart, or other carriage, shall paint in a straight line upon some conspicuous part of the right or offside thereof, or upon the offside shafts thereof, before the same shall be used upon any turnpike-road, his Christian and surname, and the place of his abode, or the Christian and surname and place of abode of the principal partner or owner thereof, in large, legible characters, not less than one inch in height, and continue the same thereupon, so long as such waggon, &c., shall be used upon any such turnpike-road; and every owner who shall use or allow the same to be used, without the name and description painted thereon as aforesaid, or shall paint any false or fictitious name or place of abode on such waggon, &c., shall forfeit for every such offence not exceeding 5*l.*—4 Geo. IV. c. 95. s. 15.

Drivers of Carts, &c.—It shall be lawful for any one person to act as the driver of two carts on any turnpike-road, and for such carts to pass and travel under the superintendence of such single person; provided that such cart, when so under the care of one person, shall be drawn by one horse each, and the horse of the hinder cart shall be attached by a rein to the back of the foremost cart: and in case the said horse shall not be so attached, the driver of the said cart shall forfeit the sum of 20*s.* Provided that this enactment shall not extend to carts travelling on any turnpike-road within ten miles of the cities of London or Westminster.—3 Geo. IV. c. 126. s. 130.

No waggon or cart travelling on any turnpike-road shall be driven by any person who shall not be of the full age of thirteen years, under a penalty not exceeding 10*s.*, to be paid by the owner of such cart or waggon.—*Ib.* s. 131.

If the driver of any waggon or cart of any kind shall ride upon any such carriages in any turnpike-road, not having some person on foot or on horseback to guide the same,

(light carts driven with reins and drawn by not more than two horses excepted), or if the driver of any carriage whatsoever on any part of any turnpike-road shall, by negligence or wilful misbehaviour, hurt or damage any person or carriage passing on such road, or quit the road and go on the other side of the hedge or fence enclosing the same, or wilfully be at such a distance from such carriage, or in such a situation that he cannot have the direction and government of the horses or cattle drawing the same, or if any person shall drive, or act as the driver of any such coach, post-chaise, or other carriage, let for hire, or waggon, &c., not having the owner's name painted thereon, or shall refuse to discover the true Christian and surname of the owners thereof; or if the driver of any waggon, &c., meeting any other carriage shall not keep his carriage on the left or near side of the road, or if any person shall wilfully prevent any other person from passing him, or any carriage under his care, or by negligence or misbehaviour hinder the free passage of any carriage, or any of his Majesty's subjects, on any turnpike-road, every driver so offending, on conviction, either by confession, the view of a justice of the peace, or by the oath of one or more credible witnesses, before any justice of the peace within the limit where such offence was committed, or where such offender shall be apprehended, shall for every such offence forfeit not exceeding 40*s*., in case such driver shall not be the owner of such carriage; in case the offender be the owner of such carriage, then any sum not exceeding 5*l*.; and in either of the said cases, in default of payment be committed to the house of correction for any time not exceeding one month, unless such forfeiture be sooner paid; and every such driver in either case may, by the authority of this act and without any warrant, be apprehended by any person who shall see such offence committed, and conveyed before such justice of the peace, to be dealt with according to law; and if any such driver shall refuse to discover his name, it shall be lawful for the justice before whom he may be taken, or to whom complaint shall be made, to commit him to the house of correction for any time not exceeding three months, or to proceed against him for the penalty aforesaid, by a description of his person and the offence only, without any name or designation, but expressing in the proceedings that he refused to discover his name.—3 Geo. IV. c. 126. s. 132.

In case any person shall resist or make forcible opposition against any person employed in the due execution of this act or any local act, or shall assault any surveyor or collector of the tolls in execution of his duty, or shall pass through any turnpike-gate, rail, &c., without paying the toll appointed to be paid at such gate or other fence, or shall hinder or make any rescue of cattle or other goods distrained by virtue of this act, such person shall, for every such offence, forfeit not exceeding 10*l*., at the discretion of the convicting justice. —3 Geo. IV. c. 126. s. 139.

4. *Farming Stock taken in Execution.*

No sheriff or other officer shall, by virtue of any process, carry off, or sell, or dispose of, for the purpose of being carried off from any lands let to farm, any straw threshed, or unthreshed, or any straw of crops growing, or any chaff, colder, or any turnips, or any manure, compost, ashes, or seaweed, in any case whatsoever; nor any hay, grass, or grasses, whether natural or artificial, nor any tares or vetches, nor any roots or vegetables, being the produce of such lands, in any case where, according to any covenant or written agreement entered into for the benefit of the landlord, such hay, grass or grasses, tares and vetches, roots or vegetables, ought not to be taken off from such lands, or which, by the tenor of such covenants, ought to be used thereon, and of which such sheriff or officer shall have received a written notice before sale.—56 Geo. III. c. 50. s. 1.

The tenant shall, on having knowledge of such process, give a written notice to the sheriff or officer of such covenants, and also of the name and residence of the landlord; and such sheriff or officer shall forthwith, and before sale, send a notice by the general post to the landlord, and also to the known steward or agent of such landlord, stating the fact of possession having been taken; and such sheriff or officer shall, in all cases, of the absence or silence of such landlord or his agent, postpone the sale until the latest day he lawfully can.—*Ib.* s. 2.

But the sheriff or officer may dispose of any crops hereinbefore mentioned, to any person who shall agree in writing to use the same on such lands, in such manner as shall accord with the custom of the country; and in cases where any covenant or agreement shall be shewn, then according to such covenant; and after such sale, so qualified, it shall be lawful for such persons to use all such necessary barns, stables, buildings, outhouses, yards, and fields, for the purpose of consuming such crops, as such sheriff or officer shall allot to them for that purpose, and which such tenant would have been entitled to have used for the like purpose.—*Ib.* s. 3.

And such sheriff or officer shall, on the request of any landlord aggrieved by any breach of such agreement, permit such landlord to bring any action in the name of such sheriff or officer, for the recovery of damages, such landlord having indemnified such sheriff or officer against costs.—*Ib.* s. 4.

Such sheriff or officer shall, before sale, make due inquiry within the parish as to the name and residence of the landlord.—*Ib.* s. 5.

In all cases where any purchaser shall have entered into any agreement with such sheriff or officer, it shall not be lawful for the landlord to distrain for rent, on any corn, hay,

straw, or other produce, severed from the soil, and sold subject to such agreement, by such sheriff or officer; nor on any turnips, whether drawn or growing, if sold according to this act; nor on any horses, sheep, or other cattle, nor on any beasts whatsover, nor on any waggons, carts, or other implements of husbandry, which any person shall employ or use for the purpose of threshing out, carrying, or consuming any such produce, under this act, and the agreement between the sheriff or officer and the purchasers of such produce.—*Ib.* s. 6.

No sheriff or officer shall sell any clover, ryegrass, or any artificial grass whatsoever, newly sown, and growing under any crop of standing corn.—*Ib.* s. 7.

But this act shall not extend to any straw, turnips, or other articles, which the tenant may remove from the farm consistently with some contract in writing.—*Ib.* s. 8.

Where any action shall be brought against such sheriff or officer, no plaintiff shall be entitled to recover any damages, unless it be proved that the breach or omission was wilful.—*Ib.* s. 9.

No sheriff or under sheriff, nor any of their deputies, agents, bailiffs, or servants, nor any persons who shall purchase any hay, straw, chaff, turnips, grasses, or other produce before-mentioned, under this act, shall be deemed to be a trespasser by reason of coming upon or remaining in possession of any barns or other buildings, yards or fields, for the purpose of threshing out or consuming any straw, hay, turnips, or other produce under this act, or for doing any thing necessary, though such acts shall have been done, after the return of the process.—*Ib.* s. 10.

No assignee of any bankrupt, or any insolvent debtor's estate, nor any assignee under any bill of sale, nor any purchaser of the goods, chattels, stock, or crops of any person engaged in husbandry, on any lands let to farm, shall take, use, or dispose of any matters as aforesaid, in any other manner than such bankrupt, insolvent debtor, or person employed in husbandry, ought to have taken, used, or disposed of the same.—*Ib.* s. 11.

5. *Costs of Distress for Rent under Twenty Pounds.*

No person whatsoever making any distress for rent, where the sum shall not exceed 20*l.*, nor any person employed in any manner in making such distress, or doing any act in the course of such distress, or for carrying the same into effect, shall take or receive out of the produce of the goods distrained upon and sold, or from the tenant distrained upon, or from the landlord or from any other person, any other costs than such as are set forth in the schedule subjoined; and no person shall make any charge for any act mentioned in the schedule, unless such act shall have been really done.—57 Geo. III. c. 83, s. 1.

If any person shall, in any manner, levy, take, or receive from any person, or retain or take from the produce of any goods sold, any greater costs, or make any charge whatsoever for any act mentioned in the schedule, and not really done, it shall be lawful for the party aggrieved to apply to one justice for redress; whereupon such justice shall summon the person complained of to appear before him, and examine into the matter of complaint by all legal ways, and also hear in like manner the defence of the person complained of; and if it appear to such justice that the person complained of shall have levied, taken, received, or had other and greater costs, or made any charge for any matter not having been really done, such justice shall adjudge treble the amount of the monies unlawfully taken to be paid to the party, together with full costs; and, in case of non-payment, such justice shall forthwith issue his warrant to levy the same by distress and sale, with the charges of distress and sale; and, in case no distress can be had, such justice shall, by warrant, commit the party to the common gaol or prison, there to remain till such order or judgment be satisfied.—*Ib.* s. 2.

It shall be lawful for such justice to summon witnesses, and to administer an oath to them; and if any person so summoned shall not obey such summons, without reasonable excuse, or refuse to be examined upon oath, or, if a quaker, upon affirmation, then every such person shall forfeit not exceeding 40*s.* to be levied as hereinbefore directed.—*Ib.* s. 3.

It shall be lawful for such justice, if he find that the complaint of the party aggrieved is not well founded, to adjudge costs not exceeding 20*s.* to be paid to the party complained against, which order shall be carried into effect in such manner as is hereinbefore directed, as to the order on such original complaint: but nothing herein contained shall empower such justice to make any order against the landlord, unless such landlord shall have personally levied such distress: also, no person who shall be aggrieved by any distress, or by any proceedings had in the course thereof, or by any costs levied upon them in respect to the same, shall be barred from any legal or other suit or remedy which he might have had before the passing of this act, excepting so far as any complaint to be preferred by virtue of this act shall have been determined by the order and judgment of the justice before whom it shall have been heard; and which order and judgment may be given in evidence under the plea of the general issue, in all cases where the matter of complaint shall be made the subject of any action.—*Ib.* s. 4.

Every broker or person who shall levy any distress shall give a copy of his charges, and of all the costs signed by him, to the person on whose goods any distress shall be levied, although the amount of the rent demanded shall exceed 20*l.*—*Ib.* s. 5.

The provisions of the above act are extended to distresses made for land tax, assessed taxes, poor rates, church rates, tithes, highway rates, sewer rates, or any other impositions whatever, not exceeding 20*l.*—7th and 8th Geo. IV. c. 17.

Schedule of the limitation of costs and charges on distresses for small rents.	£.	s.	d.
Levying distress	0	3	0
Man in possession, per day	0	2	6
Appraisement, whether by one broker or more, 6*d.* in the pound on the value of the goods.			
Stamp, the lawful amount thereof.			
All expenses of advertisements, if any such	0	10	0
Catalogues, sale and commission, and delivery of goods, 1*s.* in the pound on the net produce of the sale.			

6. *Recovery of Possession by Landlords.*

The act of 11 Geo. II. c. 19. s. 16. giving two justices power to put a landlord in possession of premises deserted by a tenant, where a year's rent is in arrear, and no sufficient distress to be had, is extended by 57 Geo. III. c. 52. to cases where only half a year's rent is due.

Where the term or interest of any tenant holding under a lease or agreement in writing for any term of years, or from year to year, has expired, or been determined either by landlord or tenant by notice to quit, and such tenant, or any person claiming under him, refuses to deliver up possession accordingly, after lawful demand in writing, made and signed by the landlord or his agent, and served personally on, or left at the usual abode of such tenant or person, and the landlord shall thereupon proceed by ejectment for recovery of possession, he may, at the foot of the declaration, address a notice to such tenant or person, requiring him to appear in the court in which such action is brought, on the 1st day of the next term, or other usual period for appearance to process then next following, there to be made defendant, and find bail, if ordered by the court. On the party's appearance at the day prescribed, or in case of his non-appearance, then, on the usual affidavit of service of declaration and notice, the landlord, on producing the lease or agreement, and proving its execution by affidavit, and on affidavit that the premises have been actually enjoyed under the same, that the tenant's interest therein has expired, or been determined by regular notice to quit, and that possession hath been lawfully demanded as above, may move the court for a rule for such tenant or person to shew cause, within a time to be fixed by the court, why such tenant, &c., on being admitted defendant, besides entering into the common rule (confessing, *inter alia*, defendant's possession R. M. T., 1820), and giving the common undertaking, should not undertake, in case of verdict for the plaintiff, to give him a judgment to be entered up against the real defendant of the term next preceding the time of trial; and also, why he should not enter into a recognizance, by himself and two sufficient sureties, in a reasonable sum conditioned to pay the costs and damages recovered by the plaintiff in the action; and the court, on cause shewn, or affidavit of the service of the rule, if no cause is shewn, may make the same absolute in the whole or in part, and shall order such tenant, &c., within a time to be fixed, to give such undertakings and find such bail as shall be specified in the rule; and if the party shall not do so, laying no ground to induce the court to enlarge the time for obeying the same, then, on affidavit of service of such order, an absolute rule shall be made for entering up judgment for the plaintiff.—1 Geo. IV. c. 87. s. 1.

Wherever hereafter it shall appear on trial of any ejectment at suit of landlord against tenant, that the latter or his attorney has been served with due notice of trial, the plaintiff shall not be nonsuited by default of defendant's appearance, or of confession of lease, entry and ouster; but the production of consent rule, and undertaking of defendant, shall be sufficient evidence thereof; and the judge before whom such cause shall be tried, whether defendant appear or not, shall permit plaintiff, after proof of his right to recover possession, to go into evidence of the mesne profits thereof, which may have accrued from the determination of tenant's interest down to the time of the verdict in the cause, or to some preceding day specially mentioned therein; and the jury on finding for plaintiff shall also include in their verdict the amount of the damages for mesne profits; and such landlord shall not be barred from bringing trespass for the subsequent mesne profits down to the day of delivery of possession.—*Ib.* s. 2.

If on the trial verdict passes for plaintiff, but it appears to the judge that the finding of the jury was contrary to evidence, or that the damages are excessive, he may order execution to be stayed until the fifth day of the ensuing term, upon the defendant's complying with certain conditions.—*Ib.* s. 3.

Where the landlord shall proceed under this act, but shall be nonsuited on the trial, or lose a verdict on the merits, he shall pay double costs.—*Ib.* s. 6.

In ejectments by landlord against tenant, where the right of entry shall have accrued in or after Hilary or Trinity terms respectively, the lessor of the plaintiff may serve a declaration within ten days after such right of entry accrued, with notice, requiring the tenant to appear and plead within ten days—provided that defendant shall have six clear days' notice of trial before the assizes, and that a judge may, on the application of defendant, make an order for time to plead or to stay or set aside the proceedings, or to postpone the trial till next assizes, if he shall see it expedient.—1 Will. IV. c. 70. s. 36.

In all ejectments at *nisi prius*, where plaintiff shall be entitled to recover, the judge may certify that plaintiff ought to have possession immediately, and he may thereupon issue a writ of possession accordingly.—*Ib.* s. 38.

7. *Larceny and Malicious Injury to Property.*

Consolidation Acts, 7 and 8 Geo. IV. cap. 29 and 30.

[N. B. The sections of the respective Acts are quoted after each paragraph, those of the Malicious Injury Act (c. 30) being, for distinction, within parentheses.]

Class I.—*Felonies punished with Death.*

Stealing any horse, mare, gelding, colt, filly, bull, cow, ox, heifer, calf, ram, ewe, sheep, or lamb, or killing any such with intent to steal the carcase or any part thereof.—25.

Arson.—Setting fire to any church, chapel, dissenting chapel, house, stable, mill, barn, &c., or any building used in trade or manufacture, whether in the possession of the offender or not. (2.)

Setting fire to any stack of corn, grain, pulse, straw, hay, or wood.—(17.)

Riotously destroying, or beginning to destroy any church or other building described in sect. (2.) or any machinery employed in any manufacture.—(8.)

Class II.—*Felonies punished with Transportation for Life, or not less than Seven Years; or by Imprisonment for not more than Four Years, with or without (if a male) one, two, or three whippings, and with or without hard labour or solitary confinement.*

Breaking and entering any building, and stealing therein any chattel, &c., such building being within the curtilage of a dwelling-house, but not having any communication therewith, either immediate, or by means of a covered and inclosed passage leading from the one to the other.—14.

Breaking and entering any shop, warehouse, or counting-house, and stealing therein any chattel, &c.—15.

Corruptly taking any reward, under pretence of helping any person to any chattel, or other property, which by any felony or misdemeanor has been stolen, taken, or obtained, unless the person taking such reward shall cause the principal offender to be brought to trial.—58.

Breaking down any sea bank, or the bank of any river, canal, or marsh, whereby any lands shall be overflowed, or be in danger thereof; or maliciously destroying any lock, sluice, or work on any navigable river or canal.—(12.)

Killing, wounding, or maiming any cattle.—(16.)

Destroying hopbinds growing on poles.—(18.)

Class III.—*Felonies punished by Transportation for not more than Fourteen, nor less than Seven Years, or by Imprisonment not exceeding Three Years, with or without (if a male) one, two, or three whippings, and with or without hard labour or solitary confinement.*

[If the offender has before been convicted of felony, the punishment is the same as for any of the offences in Class II.]

Receiving any property, knowing the same to have been stolen, where the original offence is a felony.—54.

Class IV.—*Felonies constituting Larceny,* or punished in like manner as Larceny, viz.—by Transportation for Seven Years, or by Imprisonment not exceeding Two Years, with or without (if a male) one, two, or three whippings, and with or without hard labour or solitary confinement.*

[If the offender has before been convicted of any felony, the punishment is the same as for any of the offences in Class II.]

Coursing, hunting, killing or wounding, or attempting to kill or wound, or snaring or carrying away, any deer in any *inclosed* forest, chase, or other land wherein deer are usually kept.—26.

Committing the like offence in the *uninclosed* part of any forest, &c. *for the second time.* —26.—(First time, see Class VII.)

Deer-keepers or their assistants finding any person in any forest, chase, &c., or in any inclosed field where deer are usually kept, with intent to commit any offence relative to the deer, may demand the guns, fire-arms, snares, or dogs of such person; and on refusal may seize the same.—29.

Beating or wounding any deer-keeper in the execution of his duty.—29.

Stealing, or cutting or breaking with intent to steal any glass or wood-work, or any metal, or any utensil or fixture, fixed in or to any building, or any thing of metal in any private land, or in any public square or street.—44.

Stealing, or damaging or destroying with intent to steal or to do mischief, any tree, shrub or underwood, growing in any park, pleasure ground, garden, orchard, or avenue, or in any ground adjoining or belonging to a dwelling-house, where the value of the articles stolen, or of the injury done, exceeds 1*l*.—38.—(19.)

Committing the like offence in any other situation, where the value exceeds 5*l*.—38.—(19.)

Committing the like offence in any situation, to the value of a shilling—*for the third time.*—39.—(20.)—(First and second time, see Class VII.)

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* The felonious taking of any personal chattel of another, without his consent, and against his will, with intent to convert it to the use of the taker, is larceny at common law.

Stealing or damaging or destroying with intent to steal or to do mischief, any plant, root, fruit, or vegetable, growing in any garden, orchard, nursery, conservatory, &c.—*for the second time.*—42.—(21.)—(First time, see Class VII.)

Destroying, or damaging with intent to render useless, any thrashing machine, or any machine or engine employed in any manufacture, except those of silk, woollen, linen, or cotton.—(4.)

Removing the piles or other materials of any sea bank, or of the bank of any river, canal or marsh ; or opening any floodgate, or doing any other mischief to any river or canal, with intent to obstruct the navigation thereof.—(12.)

Setting fire to any crop of corn, grain, or pulse, or to any part of a wood, coppice, or plantation, or to any furze, heath, or fern.—(17.)

Class V.—*Misdemeanors, punished by Transportation, or by Fine and Imprisonment, or by either of the latter.*

Obtaining, by false pretence, any chattel, money, or valuable security, with intent to cheat or defraud any person of the same.—53.

Persons tried for obtaining property under false pretences, shall not be acquitted on the ground that the facts proved amount to larceny.—53.

Receiving any property, knowing the same to have been stolen, or unlawfully taken or converted, where the original offence is a misdemeanor.—55.—(Punished as for a felony of Class IV.)

Destroying the dam of any fish-pond, or putting noxious matter therein, with intent to take or destroy, or so as to cause the loss of, any fish therein, or destroying the dam of any mill-pond.—(15.)

Punished as for a felony of Class IV.

Class VI.—*Misdemeanors punished by Fine and Imprisonment.*

Taking or killing, in the night-time, any hare or coney in any warren or ground lawfully used for breeding or keeping of such.—30.

Taking and destroying fish in any water running through any land adjoining to a dwelling-house.—34.—As to Angling, see Class VII.

[The owner of any ground or fishery, or his servants, may demand the rods, lines, hooks, and nets of any person found unlawfully fishing, and upon refusal may seize the same.—35.]

Throwing down or destroying any turnpike-gate, or its appurtenances, or any toll-house or engine.—(14.)

Class VII.—*Offences, punished by Fine or Imprisonment, on Summary Conviction before one Justice.*

The limit of punishment is stated between brackets after each offence. In case of fine imposed, and not paid within a period appointed by the convicting justice, the offender is to be imprisoned (with or without hard labour) for not more than two calendar months, if the amount, with costs, does not exceed 5*l.*—four calendar months, if not 10*l.*—six calendar months, if any higher sum—unless the amount be sooner paid.—67.—(33.)—Appeal lies to the Quarter Sessions, against any summary conviction where the sum adjudged exceeds 5*l.*, the imprisonment exceeds one calendar month, or the conviction is by one justice only. —72.—(38.)—Prosecution to be within three calendar months after commission of offence. —64.—(29.)

Hunting, killing, or wounding, or attempting to kill or wound, or snaring or carrying away, any deer being in the *uninclosed* part of any forest, chase, &c.—26.

[For the first time, 50*l.*—For the second time, see Class IV.]

Having in possession, when searched by warrant, any deer, or the head, skin, or other part thereof, or any snare or engine for taking of deer, and not shewing before a justice that the party came lawfully by such deer, &c. or had lawful occasion for such snare, &c.—27.—[20*l.*]

Setting or using any snare for deer, or destroying the fence of any land, where deer are kept.—28.—[20*l.*]

[See as to seizing the guns, &c. of deer-stealers, sect. 29, Class IV.]

Taking or killing, in the day time, any hare or coney in any warren or ground lawfully used for the breeding or keeping of such ; or setting or using, at any time, any snare for taking of hares or conies.—30.—[5*l.*]

Stealing any dog, or any beast or bird ordinarily kept in a state of confinement, not being the subject of Larceny at common law.—31.

[For the first time 20*l.*, and value of animal ; for second time, 12 calendar months to hard labour. One or two whippings (if a male) in addition, on second conviction before two Justices.]

Having in possession, when searched by warrant, any dog, or any such beast, or bird, or the skin or plumage thereof, knowing the same to have been stolen.—32.

[Same punishment as in the last case.]

Killing, wounding, or taking, any house dove or pigeon, under circumstances not amounting to Larceny.—33.

[2*l.* and value of bird.]

Angling in the day time, in any water running through any land adjoining to a dwelling-house.—34.—[5*l.*]

Taking or destroying, or attempting to take or destroy, any fish in any water being private property, or wherein there is a private right of fishery, but not running through any land adjoining to a dwelling-house.—34.—[5*l.* and value of fish.]—Angling in the day time, [2*l.*]

[Anglers, on delivery or seizure of their tackle, are exempt from penalty.—35.]

Knowingly receiving stolen property, where original offence punishable on summary conviction.—60.

[Same punishment as an original offender.]

Stealing, or destroying or damaging with intent to steal or to do mischief, any tree, shrub, or underwood, to the value of 1*s.*—39.—(20.)

[For first time 5*l.*, and value of injury.—For second time 12 calendar months to hard labour. One or two whippings (if a male) in addition, on second conviction before two justices.—For third time, see Class IV.]

Stealing, or breaking or destroying with intent to steal or to do mischief, any fence, wall, stile, or gate.—40.—(23.)

[Same punishment as in the last case for first and second time.—For third time, same as for second.]

Having in possession, when searched by warrant, the whole, or part of any tree, shrub, underwood, fence, post, &c., of the value of 2*s.*, and not shewing before a justice, that the party came lawfully by the same.—41.

[2*l.*, and value of article.]

Stealing, or damaging or destroying with intent to steal or to do mischief, any plant, root, fruit, or vegetable, growing in any garden, orchard, nursery, conservatory, &c.—42. —(21.)

[For first time, 6 calendar months, with or without hard labour—or 20*l.*, and value of article stolen, or of injury done.—For second time, see Class IV.]

Stealing, or damaging or destroying with intent to steal or to do mischief, any cultivated root or plant, growing in any land (but not in a garden, orchard or nursery).—43.—(22.)

[For the first time, 1 calendar month, with or without hard labour, or 20*s.* and value of article stolen or injury done, with commitment for non-payment.—For second time, 6 calendar months to hard labour. One or two whippings (if a male) in addition, on second conviction before two justices.]

Damaging, injuring, or spoiling any real or personal property whatever, for which no punishment is before provided.—(24.)

[Compensation, not exceeding 5*l.*, or commitment for 2 calendar months in default of payment.] *Exceptions*, trespasses where the party complained of acted under a reasonable supposition of right; and trespasses, not wilful and malicious, committed in hunting, fishing, or pursuit of game.

Class VIII.—*Offence punished by Forfeiture of 50l. to him that will sue.*

Advertising a reward for the return of stolen or lost property, and intimating that the person producing the same will not be questioned, seized, or inquired after; or promising in such advertisement to return any money which may have been paid for such property by way of purchase or loan.—59.

Miscellaneous Enactments relating to the foregoing Offences.

The owner of stolen property, prosecuting the thief or receiver to conviction, shall have restitution of his property.—57.

Principals in the second degree, to Felonies punishable under these acts, and accessories before the fact, shall be punished as principals in the first degree. Accessories after the fact (except receivers of stolen property) shall be punished by imprisonment not exceeding 2 years, with or without hard labour or solitary confinement. And aiders and abettors in misdemeanors shall be punished as principal offenders.—61.—(26.)

Aiders and abettors in offences punishable on summary conviction shall be punished as principals.—62.—(31.)

Persons in the act of committing any offence, (except that of angling in the day time,) may be apprehended by any peace-officer, or by the owner of the property, without a warrant. One justice, upon good grounds of suspicion, proved on oath, may grant a warrant to search for property stolen, &c. Any person, to whom any property suspected to have been stolen, &c., is offered for sale or pledge, may and is required to apprehend the party offering same.—63.—(28.)

Sums forfeited and penalties imposed, on summary conviction, are to be applied in aid of the county rate, except sums forfeited for the value of property stolen or injured, which are to be paid to the owner, if he is known, and has not been examined in proof of the offence.—66.—(32.)

Any person summarily convicted before a justice, if it be his first offence, may be discharged therefrom by such justice, on making satisfaction to the party aggrieved, for damages and costs.—68.—(34.)

A summary conviction shall be a bar to any other proceedings for the same cause.—70. —(36.)

Persons maliciously committing any offence shall be punished, whether the malice be against the owner of the property or not.—(25.)

8. *Improper Treatment of Cattle.*

If any person shall wantonly and cruelly beat, abuse, or ill-treat any horse, mare, gelding, mule, ass, ox, cow, heifer, steer, sheep, or other cattle, any justice may, by summons or warrant, bring the party before him, or any other justice; and if the party or parties accused shall be convicted of any such offence, either by confession, or upon information upon oath, he, she, or they so convicted, shall forfeit not exceeding 5*l.*, nor less than 10*s.*, or be committed to the House of Correction for any time not exceeding three months.—3 Geo. IV. c. 71. s. 1.

No person to be punished unless complaint made within ten days after the offence.—s. 2.

Justices may order compensation not exceeding 20*s.* to persons vexatiously complained against.—s. 5.

9. *Unlawful Sale and Destruction of Game.*

If any person, whether qualified to kill game or not, shall buy any hare, pheasant, partridge, moor heath game or grouse, and shall be convicted thereof within six calendar months before any justice, by the oath of one or more witnesses, he shall, for every hare, &c. so bought, forfeit 5*l.*; one half to the informer, and the other to the poor of the parish where the offence was committed; to be levied by distress.—58 Geo. III. c. 75. s. 1.

And every person who shall buy, sell, or offer to sell, or have unlawfully in possession any hare, &c. (as in s. 1), shall make discovery of any other person that hath within six calendar months bought or sold any such game as aforesaid, so as he or she shall be convicted, such discoverer shall be discharged from all penalties under this act to which he may be liable at the time of making such discovery; and shall receive the same advantage as any other informer is entitled to under this act for such information; but such discoverer shall not be discharged from any penalties for which a prosecution is actually pending, or conviction or judgment had against him at the time of making such discovery.—*Ib.* s. 2.

Any person may proceed to recover penalties incurred under this act by information, or may bring actions for the same for his own use within six months in any court of record.—*Ib.* s. 3.

If any person shall, by night, unlawfully take or destroy any game or rabbits in any land, whether open or inclosed, or shall by night unlawfully enter or be in any land, whether open or inclosed, with any gun, net, engine, or other instrument, for the purpose of taking or destroying game, such offender shall, upon conviction before two justices of the peace, be committed for the first offence to gaol for a period not exceeding three calendar months, to hard labour, and at the expiration of such period shall find sureties by recognizance, himself in ten pounds, and two sureties in five pounds each, or one surety in ten pounds, for his not so offending again for one year; and in default, shall be further imprisoned and kept to hard labour for six calendar months, unless such sureties are sooner found; and in case such person shall so offend a second time, and be convicted, he shall be committed to gaol for not exceeding six calendar months, to hard labour, and at the expiration of such period shall find sureties, himself in twenty pounds, and two sureties in ten pounds each, or one surety in twenty pounds, for not offending again for two years; and in default, shall be further imprisoned and kept to hard labour for one year, unless such sureties are sooner found; and in case such person shall so offend a third time, he shall be guilty of a misdemeanor, and being convicted thereof, shall be liable to be transported for seven years, or to be imprisoned and kept to hard labour for not exceeding two years.—9 Geo. IV. c. 69. s. 1.

Where any person shall be found upon any land committing any such offence, it shall be lawful for the owner or occupier of such land, or for any person having a right or reputed right of free warren or free chase thereon, or for the lord of the manor, and also for any gamekeeper or servant of any of the persons herein mentioned, or any person assisting such gamekeeper or servant, to seize and apprehend such offender upon such land, (or in case of pursuit being made, in any other place to which he may have escaped therefrom,) and to deliver him, as soon as may be, into the custody of a peace officer, in order to his being conveyed before two justices of the peace; and in case such offender shall assault or offer any violence with any offensive weapon whatsoever, towards any person hereby authorized to seize and apprehend him, he shall, whether it be his first, second, or any other offence, be guilty of a misdemeanor, and being convicted thereof, shall be liable to be transported for seven years, or to be imprisoned and kept to hard labour, for not exceeding two years.—*Ib.* s. 2.

Time for proceedings under this act limited to six calendar months after offence, for summary conviction, and to twelve calendar months for indictment.—*Ib.* s. 4.

Appeal may be made to the quarter-sessions upon giving notice within three days after conviction.—*Ib.* s. 6.

If any persons, to the number of three or more together, shall by night unlawfully enter or be in any land, whether opened or inclosed, for the purpose of taking or destroying game or rabbits, any of such persons being armed with any offensive weapon, each person

shall be guilty of a misdemeanor, and being convicted thereof, shall be liable to be transported for not exceeding fourteen years nor less than seven years, or to be imprisoned and kept to hard labour for not exceeding three years.—*Ib.* s. 9.

Provided always, that for the purposes of this act the night shall be considered to commence at the expiration of the first hour after sunset, and to conclude at the beginning of the last hour before sunrise.—*Ib.* s. 12.

That for the purposes of this act the word "Game" shall be deemed to include hares, pheasants, partridges, grouse, heath or moor game, black game, and bustards.—*Ib.* s. 13.

10. *Prohibition of Man Traps, &c.*

If any person shall set or place, or cause to be set or placed, any spring gun, man trap, or other engine, with the intent that the same or whereby the same may destroy or inflict grievous bodily harm upon a trespasser, or other person coming in contact therewith, such person shall be guilty of a misdemeanor.—7 and 8 Geo. IV. c. 18. s. 1.

Provided, that it shall not be illegal to set any gin or trap, such as may have been usually set with the intent of destroying vermin.—*Ib.* s. 2.

And if any person shall knowingly and wilfully permit any such engine, which may have been set, fixed, or left in any place then being in or afterwards coming into his or her possession or occupation, by some other person, to continue so set or fixed, the person so permitting the same to continue shall be deemed to have set and fixed such engine, with such intent as aforesaid.—*Ib.* s. 3.

Provided, That it shall not be a misdemeanor, within the meaning of this act, to set, from sunset to sunrise, any engine in a dwelling-house for the protection thereof.—*Ib.* s. 4.

11. *Weights and Measures.*

Measure of Capacity.—The standard measure of capacity, as well for liquids as for dry goods not measured by heap measure, shall be THE GALLON, containing ten pounds avoirdupois weight of distilled water (weighed in air at the temperature of 62° Fahr., barometer at 30 in.), and such measure shall be the imperial standard gallon, and shall be the unit and only standard measure of capacity from which all other measures of capacity to be used, as well for wine, beer, ale, spirits, and all sorts of liquids, as for dry goods not measured by heap measure, shall be derived, computed, and ascertained. All measures shall be taken in parts or multiples, or certain proportions of the said imperial standard gallon: and the quart shall be the fourth part, and the pint one-eighth of such standard gallon: two gallons shall be a peck, eight gallons shall be a bushel, and eight bushels a quarter of corn or other dry goods not measured by heap measure.—5 Geo. IV. c. 74. s. 6.

The standard measure of capacity for coals, culm, lime, fish, potatoes, fruit, and all other goods and things commonly sold by heaped measure, shall be the aforesaid bushel, containing eighty pounds avoirdupois of water as aforesaid, the same being made round, with a plain and even bottom, and being nineteen inches and a half from outside to outside of such standard measure as aforesaid.—*Ib.* s. 7.

In making use of such bushel, all coals and other goods and things commonly sold by heaped measure shall be duly heaped up in such bushel in the form of a cone, such cone to be of the height of at least six inches, and the outside of the bushel to be the extremity of the base of such cone*: three bushels shall be a sack, and twelve sacks shall be a chaldron. *Ib.* s. 8.

Provided, that any contracts, bargains, sales, and dealings made or had for or with respect to any coals, culm, lime, fish, potatoes, or fruit, and all other goods and things commonly sold by heaped measure, to be sold, delivered, done or agreed for by weight or measure, shall and may be either according to the standard of weight, or the standard for heaped measure; but all contracts, sales, bargains, and dealings made or had for any other goods, wares, or merchandise, or other thing, to be sold, delivered, done or agreed for by weight, or measure, shall be made and had according to the standard of weight, or to the said gallon, or the parts, multiples or proportions thereof; and in using the same the measures shall not be heaped, but shall be stricken with a round stick or roller, straight and of the same diameter from end to end.—*Ib.* s. 9.

In all cases of dispute respecting the correctness of any measure of capacity, arising in a place where recourse cannot be conveniently had to any verified copies or models, it shall be lawful for any justice of the peace to ascertain the contents of such measure of capacity by direct reference to the weight of pure or rain water which such measure is capable of containing, ten pounds avoirdupois weight of such water (at the temperature of 62° Fahr.) being the standard gallon ascertained by this act, the same being in bulk equal to 277 cubic inches and 274 one-thousandth parts of a cubic inch, and so in proportion for all parts or multiples of a gallon.—*Ib.* s. 14.

All contracts, bargains, sales, and dealings which shall be made or had within any part of the United Kingdom for any work to be done, or for any goods, wares, merchandise or other thing to be sold, delivered, done, or agreed for by weight or measure, where no spe-

* By 6 Geo. IV. c. 12. the outside diameter of every measure for heaped goods is required to be at least double the depth, and the height of the heap at least three-fourths of the depth.

cial agreement shall be made to the contrary, shall be deemed to be made and had according to the standard weights and measures ascertained by this act; and in all cases where any special agreement shall be made with reference to any weight or measure established by local custom, the ratio or proportion which every such local weight or measure shall bear to any of the said standard weights or measures, shall be expressed, declared, and specified, in such agreement, or otherwise such agreement shall be null and void.—*Ib.* s. 15.

APPENDIX III.

EPITOME OF THE LAW RELATIVE TO TITHES.

Tithes are an ecclesiastical inheritance collateral to the land, and properly due to the rector or other like ecclesiastical person. Tithes are either *prædial*, *personal*, *or mixed*.

1. Prædial Tithes are such as arise from the land spontaneously, or by cultivation: as tithes of corn, hay, wood, herbs, wine, flax, hops, and fruits.

2. Mixed Tithes are such as arise from cattle and other beasts receiving their nourishment upon the land, such as are due in respect of calves, lambs, kids, pigs, wool, milk, cheese, eggs, and the like.

3. Personal Tithes are the tenth part of the clear gain which is raised from the personal labour of a man, his charges and expenses, according to his condition and degree, being deducted; but these are only payable in such places as had accustomably, for forty years before the statute 2 and 3 Ed. VI. c. 13, paid personal tithes.

Tithes are again distinguished into great and small.

Great Tithes are chiefly of corn, hay, and wood; and Small Tithes are in general, unless there has been an immemorial usage to the contrary, all other prædial tithes, and likewise those tithes which are mixed and personal.

In what manner Tithes are to be set out.

1. Of the Produce of the Earth.—It is a leading principle in setting out every sort of tithe, that the tenth part be severed from the rest, and the whole left on the ground a reasonable time for the tithe owner to see and judge whether his part is fairly set out or not.

Wheat and Rye—by the tenth sheaf; or by the tenth shock, by custom.

Barley and Oats—by the tenth cock, or shock; and, also, the tenth sheaf, by custom.

Beans, Peas, Tares, and other Pulse—as soon as the crop comes into proper parcels, so that the tithe may be clearly ascertained.

Stubble.—Corn stubble, employed in purposes of husbandry and tillage of the lands of the farm on which it grew, yields no tithe; but if sold or otherwise disposed of, then by the tenth of its value.

Hay, Clover, and other Artificial Grasses—by the tenth grass cock, after having been tedded from the swarth, of the first mowing; and, also, of the second mowing, if made into hay; but the occupier may make the grass into cocks immediately it is cut, if he think fit.

After-math of Grass, Clover, or other Artificial grasses—if eaten by barren and unprofitable stock, by an agistment tithe.

Clover, Artificial Grasses, and also Turnip, Colè, and Rape—if grown for seed, by the tenth measure of the seed when threshed out*.

Turnips—if pulled, by every tenth turnip, if in small quantity; by the tenth heap, if the growth of an acre or more.

Turnips, Rape, and Cole—if eaten, whether by profitable or unprofitable stock, by an agistment tithe.

Barren Lands—titheable when cultivated. But land which would not bear corn of itself without very great expense in manuring, is by 2 and 3 Ed. VI. exempt from tithes for the first seven years, after being converted into arable or meadow.

Flax and Hemp—the tithes thereof are ascertained at 5*s.* per acre, by 11 and 12 Wm. III. c. 16, made perpetual by 1 Geo. I. stat. 2. c. 26. Madder also was titheable at the same rate by an act which expired in 1779.

Wood—by the tenth heap or gathering.

Saffron—by a tenth, when gathered, though only once in three years.

Hops—by the tenth bushel after picking.

Potatoes, and other Roots growing in the Fields—by a tenth of their produce when dug up.

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* But in Lloyd *v.* Bentley, 1775, it was held that tithe of clover seed must be set out on the stalk in the field.

Gardens and Orchards—by a tenth of their produce, to be set out from time to time, as severed.

Nursery Grounds—by a tenth part of their produce, whether fruits or plants, indigenous or exotic, if sold in the way of trade.

Timber—that is, oak, ash, and elm, above twenty years' growth, are considered part of the freehold, and not liable to tithe, except when cut down and sold as fire-wood, or converted into charcoal. Other trees, as beech, &c. may, by the custom of particular districts, be deemed timber, and come within the privilege. As to the loppings and branches of timber trees, and the shoots that arise from old stems, there are very nice distinctions, which our limits will not admit of being detailed.

Underwood—generally, is liable to tithe, which is to be set out as cut in rows or bundles.

Wood, broom, or furze—cut for fuel, and consumed in the house, being in the same parish where it grew, is not titheable.

Hop-poles—are not titheable.

2. Of Sheep.—The tithes are to be taken as follows :—

Lambs—by every tenth lamb, to be taken away when able to live upon the same food as the dam ; and the tenth of the value of the odd numbers : if sold upon the fall, the tenth of what they sold for : bought-in and put-to ewes, by an agistment tithe, to be computed from the time of weaning, unless kept until shear-day and sheared.

Ewes and Lambs—sold or removed out of the parish before shear-day, by an agistment tithe, to be computed from the last shear-day.

Feeding Sheep, Shearlings, or Hogs bred, or bought in—by an agistment tithe, if sold or removed before shear-day to be computed from the last shear-day ; but, if bought in from that day, until sold or removed.

Sheep.—Bought in and kept until shear-day, by the tenth weight of their wool.

Sheep dying.—Dying after shear-day of the rot, or otherwise, whether bought in or bred upon the farm, by an agistment tithe, to be computed from the last shear-day, if bred on the farm ; but, if bought in, from that time until they died.

Ewes removed out of the Parish to lamb—by the tenth lamb, according to the number of ewes, and by the tenth of the value for the odd numbers.

Ewes or other Sheep removed out of the Parish to be sheared—by the tenth fleece, according to the number, and by the tenth of the weight of the odd fleeces.

Wool.—The tenth part by weight at the time of shearing. The parson is entitled to the tithe of wool of lambs, though he has received the tithe of the lambs in their wool.

3. Of Beasts.—The tithes are to be taken as follows :—

Calves—by the tenth, if ten or more ; to be taken at the time of weaning, and by a tenth of the value of odd number ; if one or more, and sold upon the fall, or fed for the butchers,—by the tenth of the price sold for, and in the same manner for all above ten.

Calves reared for the Plough or Pail—yield no tithe ; but, if sold or removed before they are worked or milked, by an agistment tithe, to be computed from the time they become yearlings, until sold or removed.

Working Beasts—yield no tithe while working, unless they work for hire or profit, or are employed in another parish than that in which the owner lives ; then by an agistment tithe.

Beasts turned off to feed—by an agistment tithe, to be computed from the day turned off until sold or removed.

Cows sold before Calving, or Dying—by an agistment tithe, to be computed from the time they were let dry, until they were sold or dies.

Beasts bought in and sold again—by an agistment tithe, to be computed from the day bought in, until sold, except when kept in the straw-yard, and fed with straw ; but no exception, if fed with hay, though the hay had before paid tithe.

Milk.—The whole of the milk obtained on each tenth milking, as well in the morning as in the evening, to be computed from the time the first cow, after calving, is brought to the pail and milked ; and so of every cow after calving ; and no regard is paid to what they eat. The cow-keeper is to give notice to the parson when and where he goes to milk his cows, and he is to draw the milk into vessels of his own ; but the parson is to carry it from thence in his own vessels, unless there be a custom in the parish for the cow-keeper to deliver it elsewhere, or at the church porch ; and unless he milk his cows in another parish than that in which they are fed ; for the tithe of milk is payable to the parson of the parish in which the cows are fed, and not in that in which they are milked ; in this case therefore he is not obliged to fetch it, but the cow-keeper must bring it to him.

4. Of Horses.—The tithes are taken in the following manner :—

Foals—by the tenth, if ten, to be taken at the time of weaning ; and by the tenth of the value of all above or under ten : if sold before used for the plough, by an agistment tithe, to be computed from the time they become yearlings, until sold or removed.

Horses kept for working the farm yield no tithe while working ; but, if used for hire or profit, or employed in another parish than that in which the owner lives, then by an agistment tithe.

Saddle and Pleasure Horses.—Saddle horses, and horses used for pleasure only, yield no tithe ; but, if used for hire or profit, by an agistment tithe.

Horses turned up or bought to feed for Sale—by an agistment tithe, to be computed from the time turned up or bought in until sold or removed.

Brood Mares and Horses taken in to feed or agist at so much per week,—by an agistment tithe for the time kept.

It is to be observed, that the true principle of agistment tithe is not the improvement of the animal, but the tenth of what the land is worth to let for taking in the cattle of another person to agist; and land, on which cattle are fed for slaughter, should be rated at double the value of the land on which store cattle are fed.

5. Of Pigs.—The tithes are to be taken by the tenth pig, if ten, to be taken at the time of weaning; and, for all above or under ten, the tenth of the value thereof at weaning.

If bought and resold.—By the tenth of the clear profit thereof.

6. Of Rabbits and Deer.—No tithe is payable of common right, for any animals *feræ naturæ*, but tithe is payable for rabbits, by custom, if sold, by the tenth of both skin and carcass at every killing; and, in like manner, deer also will yield a tithe, if sold for profit.

7. Of Fish.—No tithe is payable, except in certain places by immemorial usage.

8. Of Pigeons.—The tithe is taken by the tenth of the value when sold.

9. Of Wild Fowl.—Taken in decoys, and sold for profit, the tithe is taken by the tenth of the value when sold.

10. Of Honey and Wax.—The tithe is taken by the tenth measure of honey, and the tenth weight of wax.

11. Of Eggs.—The tithe is taken by the tenth egg of all turkeys, hens, geese, ducks, or other domesticated fowl, and by the tenth weight of the feathers of geese.

12. Of Mills.—The tithe of corn-mills shall be paid by the tenth toll dish, but ancient mills, *i. e.* those that existed before 9th Edw. II. are exempt.

Payment of Tithes.

By stat. 2 and 3 Ed. VI. c. 13, No person shall be sued for, or pay any tithes for any lands, which, by the laws and statutes of this realm, or by privilege or prescription, are not chargeable, or are discharged by real composition; that is, by an ancient modus.

Therefore, of common right, tithes are payable in respect of all lands not falling within the exemption of this statute, and must be paid to whom they are due by the actual occupier.

The crops must be severed, and the tithe set out, before the farmer removes his own nine parts: and he cannot remove such nine parts, and leave the tenth for the tithe; for, by the statute before referred to, the parson or his servant hath a right *to see his tithes truly set forth* and severed from the nine parts: consequently, a custom that the tithes shall be set out *absque visu et tactu* of the parson is not good.

But, if there be two impropriators, the farmer need not divide his tithes into moieties when they are severed.

At common law, notice need not be given when tithes are set out, even to support an action on the case for not fetching them away in time: but it is required by the ecclesiastical law. A custom to give notice is good; and as very slight evidence will support such a custom, it seems to be very proper, in all cases, to give the parson notice of the severance before the action is brought.

When the tithes are divided from the nine parts, it is the business of the parson or impropriator to watch them; and if he do not take away his tithes within a reasonable time, but suffers them after severance to continue upon the land to the damage of the farmer, an action lies against him, at the suit of the farmer.

So, if a parishioner by custom ought to deliver to the parson so many cheeses in lieu of tithe milk, and he tender them to the parson, who refuses them, and permits them to remain in his house, whereby his house is damaged, an action lies against the parson.

The farmer may also distrain tithes as *damage feasant*, which continue upon his land for an unreasonable time to his damage: for all chattels trespassing upon land may be so distrained.

But, though the parson or impropriator do not remove the tithes in a convenient time, the farmer cannot put in his cattle and depasture them.

Remedies for Tithes.—If tithes be not set out by the occupier at the proper time, but the whole crop is carried off and converted to his own use, it is called a subtraction of tithes, the remedies for which are either in the ecclesiastical courts, the temporal courts, or before justices of the peace, as hereinafter mentioned.

1st. *In Ecclesiastical Courts.*—In all cases of subtraction of tithes due, the proprietor, whether ecclesiastical or lay, may by 2 and 3 Ed. VI. c. 13, sue for the single value in the ecclesiastical court; and for the double value, where prædial tithes are detained; and shall recover the tithes themselves as well as the double value.

2ndly. *In the Courts at Westminster.*—By the same statute an action of debt for the *treble* value lies in the courts of law against him who carries away the tithes arising on his lands, without severance from the nine parts, or making a composition for them; and it may be brought by a lay-impropriator or his lessee, as well as by an ecclesiastical person. But an action does not lie for the *treble* value for any other than prædial tithes.

So, also, where tithes are duly set out, and afterwards a lay person takes them away, an action of trespass lies.

In the Court of Exchequer, also, upon a bill filed by a parson against his parishioner for a discovery and subtraction of tithes, the court decrees the single value, with costs and payment *in futuro*.

And it is said in an old case, that a bill may be for a discovery (in order to sue for the treble value at common law), though he does not offer to take the single value only; but this is doubted.

The *Court of Chancery* possesses the same jurisdiction, also, as the Court of Exchequer, in relation to the subtraction of tithes.

And, by 53 Geo. III. c. 127. s. 5. No action shall be brought for any penalty, nor any suit commenced in any equity or ecclesiastical court, to recover the value of any tithes, unless within six years after the tithes became due.

3rdly. *Before Justices of the Peace;* for *small tithes* not exceeding 10*l.* in amount; and in the case of *Quakers*, for *any tithes* not exceeding 50*l.*

By stat. 7 and 8 Will. III. c. 6. entitled "An Act for the more easy Recovery of Small Tithes," (as enlarged by the stat. 53 Geo. III. c. 127. s. 4.) it is enacted,

That every person shall truly set out and pay all small tithes and compositions for the same, with all offerings, oblations, and obventions, to the rectors, vicars, and other persons to whom they shall be due, according to the rights, customs, and prescriptions used within the respective parishes.—s. 1.

And if any person shall subtract, or fail in the payment of any small tithes, oblations, or compositions not exceeding 10*l.* in amount, by the space of twenty days after demand, it shall be lawful for the persons, to whom the same shall be due, to make their complaint in writing unto two justices of peace within the place where the same shall grow due, neither of them being patron of the church or chapel, nor interested in such tithes, &c.—*Ib.*

And thereupon the justices are to summon in writing, by reasonable warning, every person against whom such complaint shall be made. And, after his appearance, or, upon default of appearance, the justices shall proceed to hear and determine the complaint (provided it be made within two years next after the said tithes or offerings become due, s. 6); and, upon proof, shall, in writing, adjudge the case, and give such compensation as they shall judge reasonable, and also costs not exceeding 10*s.*—s. 2.

Also, they may give costs not exceeding 10*s.* to the party prosecuted, if they find the complaint false and vexatious.—s. 12.

And if any person shall neglect, by ten days after notice, to pay any such sum, as upon such complaint shall by two justices be adjudged, the constables and churchwardens of the parish, or one of them, shall, by warrant of the said justices, distrain the goods of the party; and, after detaining them three days,* in case the sum adjudged, together with the reasonable charges of making and keeping the distress, be not paid, shall make public sale of the same, and pay thereout to the party complaining, the sum adjudged, tendering the overplus to the owner.—s. 3.

And if any person against whom such judgment shall be had, shall remove out of the county, after judgment, and before the levying the sum, the justices, or one of them, shall certify the same to any justice of peace of such other county wherein the person shall be inhabitant; which justice is required, in like manner, to levy the sum adjudged upon the goods of such person.—s. 10.

But any person aggrieved by any judgment given by such two justices, may appeal to the next quarter-sessions; and if the justices then present find cause to confirm the judgment, they shall give costs against the appellant, to be levied by distress and sale of goods. And no proceedings under this act shall be removed or superseded by *certiorari*, or other writ, unless the title of such tithes, offerings, oblations, or obventions, be in question.† —s. 7.

And where any person complained of, for subtracting small tithes or offerings, shall, before the justices, insist upon any prescription, composition, or *modus*, agreement or title, and deliver the same in writing to the justices, subscribed by him; and shall then give to the party complaining, security, to the satisfaction of the justices, to pay all such costs and damages as upon a trial at law shall be given against him, in case the said prescription shall not be allowed;—the justices shall forbear to give judgment in the matter, and the persons complaining shall be at liberty to prosecute such persons for their subtraction in any other court.—s. 8.

And every person who shall obtain any judgment, or against whom any judgment shall be obtained, shall cause the same to be enrolled at the next quarter-sessions.—s. 9.

This act shall not extend to any tithes or offerings within London, nor to any other city or town corporate, where the same are settled by act of parliament.—s. 5.

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* Not less than four days, nor more than eight, 27 Geo. II. c. 20. The costs of the distress and sale will now be regulated by 57 Geo. III. c. 93, *ante*.

† In the construction of this statute, it has been held that, if the party insist on any matter of law before the justices, which is any way doubtful, as on a custom in a parish to be discharged of a certain kind of tithes, or the like,—the order may be removed.

Also, any person who shall begin any suit for recovery of small tithes or offerings in his Majesty's Court of Exchequer, or in any ecclesiastical court, shall have no benefit by this act for the same matter.—s. 14.

Quakers' Tithes.—Where any Quaker shall refuse to pay or compound for his great or small tithes, or to pay any church rates, or any tithes or rates, or other rights, dues, or payments belonging to any church or chapel, which, of right, by law and custom, ought to be paid for the stipend or maintenance of any minister or curate officiating therein, it shall be lawful for any two justices of peace of the same county, not being the patron of the church (or chapel), or interested in the tithes, upon the complaint of any parson, vicar, curate, farmer, or proprietor of tithes, or churchwarden, chapelwarden, or other person who ought to have, receive, or collect, any such tithes, rights, dues, or payments, to summon such Quaker; and, after his appearance, or in default thereof, the said summons being proved upon oath, to proceed to hear and determine the complaint.—7 and 8 Will. III. c. 34. s. 4.—1 Geo. I. st. 2. c. 6.

And they are to examine, upon oath, the justice of the complaint; and to ascertain what is payable by such Quaker; and, to order payment, so as the sum do not exceed 50*l.* —7 and 8 Will. III. c. 34. s. 4.—53 Geo. III. c. 127. s. 6.

And they are also to order reasonable costs, not exceeding 10*s.*—1 Geo. I. st. 2. c. 6. s. 2.

And, upon refusal to pay, one justice may levy the money by distress and sale of the goods of such offender, his executors or administrators.—7 and 8 Will. III. c. 34. s. 4.—1 Geo. I. st. 2. c. 6. s. 2.

But any person aggrieved by the judgment of the two justices, may appeal to the next quarter-sessions; and, if the justices find cause to confirm the judgment given by the two justices, they shall give costs against the appellant.—*Ib.*

In case of an appeal, no warrant of distress shall be granted until after such appeal be determined.—s. 5.

And no proceedings, by virtue of these acts, shall be removed by *certiorari* or other writ, unless the title of such tithes shall be in question.—7 and 8 Will. III. c. 34. s. 4.

But the mere scruple of any Quakers to pay any demands of this nature, and a general allegation that they controverted the tithe, and that it was really in question, without any further particulars, or showing at all upon what ground they controverted the payment, is not a sufficient ground for removing the order.

By 27 Hen. VIII. c. 20. if the ecclesiastical judge shall, for any contempt, contumacy, disobedience, or other misdemeanor, of any defendant in the case of tithes, make information and request to the justices of the peace of the shire where the offender dwelleth, to assist him to order and reform any such person; two of the said justices may cause the person to be attached, and commit him to ward till he shall have found sufficient surety by recognizance or otherwise, to give due obedience to the process, decrees, and sentences, of the ecclesiastical court, where the suit shall be.—s. 1.

And, by 32 Hen. VIII. c. 7. s. 4. if any person, after sentence definitive given against him in the ecclesiastical court, shall obstinately and wilfully refuse to pay his tithes or duties, or sums of money adjudged for the same; two justices may, upon information, certificate, or complaint in writing, by the ecclesiastical judge, cause the party refusing, to be attached, and committed to the next gaol, till he shall have found sufficient sureties, by recognizance or otherwise, to perform the said definitive sentence and judgment.

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Mr. Adams, Gardener to Richard Weekes, Esq., Hurstperpoint, Sussex
Aldrich, Offham Nursery, Hamsey, Sussex
Anderson, Gardener to General Hepburn, Hook-place, Chailey, Sussex
Andrews, Gardener, Fetcham Park, Surrey
Archibold, Gardener to the Earl of Sheffield, Fletching, Sussex
Ashworth, Gardener, Dale Park, Madehurst, Sussex
Atkins, Gardener, Moulscombe, near Brighton, Sussex
Barnard, Fruiterer and Seedsman, Epsom, Surrey

Mr. Bayles, Gardener to Lady Howard, Arundel Road, Sussex
Bedlecombe, Gardener, Pound Hill, Worth Sussex
Bower, Gardener to Lord Selsea, Westdean, Sussex
Bradley, Gardener to the Earl of Arran, Bognor, Sussex
Bright, Gardener, Castle Goring Gardens, Arundel Road, Sussex
Bright, Gardener, Findon, Sussex
Brown Gardener to the Rt. Hon. Earl of Ashburnham, Ashburnham Place, Sussex
Bungard and Sons, Nurserymen, Maidstone, Kent
Burgess, Gardener, Hurstperpoint, Sussex
Burtenshaw, Gardener, Sompting, Sussex
Cameron, Nursery Gardens, Uckfield, Sussex
Carson, Gardener, Danny Place, Hurstperpoint, Sussex
Clifton, Gardener to Lord Sondes, Lees Court, Kent
Cobbett, Nurseryman, Horsell, Surrey
Coull, Gardener to Sir John Shelley, Bart., M. P., Maresfield Park, Sussex
Cousins, Gardener Tangmere, Sussex
Cormack, Son, and Sinclair, Agricultural and Horticultural Seedsmen, New Cross, Surrey, and Bedford Conservatories, Covent Garden, London.
Cuddy, Gardener to Sir John Ried, Ewell, Surrey
Deas. Gardener to the Duke of Norfolk, Arundel Castle, Sussex
Dicks, Gardener, Woolavington, Sussex
Doust, Gardener, Eastbourne, Sussex
Elphiston, Gardener, Chestham, Henfield, Sussex
Fisher, Gardener, &c., 61, London Road, Brighton, Sussex
French, Gardener, Malling, Lewes Sussex
Funnell. Gardener, Wilmington, Sussex
Gibbs, Wood's Nursery, Maresfield, Sussex
Goatcher, Gardener, Woolavington, Sussex
Goatcher, Gardener, Petworth, Sussex
Gorman, Gardener to the Duke of Richmond, Goodwood, Sussex
Gorsuch, Gardener to the Bishop of Chichester, Chichester, Sussex
Gosling, Gardener, Cobham Park, Surrey
Hammond, Gardener, Chichester, Sussex
Haylor, Gardener, Rose Hill Gardens, Brighton
Head. Worthing Nursery, Worthing, Sussex
Hislop, Gardener, Ashted Park, Surrey
Hislop, Gardener, Bognor, Sussex
Hollamby, Nurseryman, &c. Tunbridge Wells, Kent
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Holman, Gardener to the Earl of Chichester, Stanmer Park, Sussex
Hooker, Nurseryman Brenchley Kent
Hornsby, Gardener, Madehurst Lodge, Sussex
Hovvey, Gardener, Yapton House, Sussex
Hudson, Gardener, Horsted Place, Sussex
Hudson, (Hy) Gardener, Horsted Place, Sussex
Hunston, Gardener to Lord Colchester, Kidbrook, Sussex
Jackman, Nurseryman, &c. Woking, Surrey
Jubb, Gardener to Lord Viscount Gage, Firle Place, Sussex
Kennett, Nurseryman, &c., Yapton, Sussex
King, Gardener to the Duke of Richmond, Goodwood, Sussex
Laker, Gardener, Worth Hall, Sussex
Lamb, Gardener, West Grinsted Park, Sussex
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Lassetter, Gardener, Michelgrove, Sussex
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Mackintosh, Gardener to Prince Leopold, Claremont Park, Surrey
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Page, Gardener to Lord Arden, Nork Park, near Epsom, Surrey
Perry, Gardener, Bignor Park, Sussex
Pierce, Nurseryman, Piltdown, Fletching, Sussex
Piper, Nurseryman Seedsman, &c. Tunbridge Wells, Kent
Reed, Gardener to the Earl of Abergavenny, Erridge Castle, Sussex
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Waghorn, Gardener, Frant, Sussex
Waterer, Nurseryman, Knapp Hill, Surrey
Webb, Westergate Nursery, Arundel Road, Sussex
Wells, Gardener Avisford, Sussex
Wells, Gardener, Redleaf, Penshurst, Kent
West, Nurseryman and Seedsman, Pound Hill, Worth, near EastGrinsted and Crawley
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In the complex concerns of agriculture, nothing can tend more to insure success, or to render easy the management of a farm, than the adoption of a system of accounts that is at once simple and comprehensive. Formerly, although there is no trade or profession which requires greater care and exactness in accounts than does that of a farmer, strange to say, not one in ten thought it necessary to adopt any system whatsoever. This may partly have arisen from the difficulty of forming such a plan as would enable them to keep with ease and accuracy an account of their varied dealings. Many systems of farming accounts have been published; but none have answered the object of the farmer so completely as BAXTER'S FARMERS ACCOUNT BOOK. Mr. Malcomb, the experienced author, strongly recommends the adoption of BAXTER'S ACCOUNT BOOKS, as being superior to any hitherto devised. "In Mr. Baxter's publication, (says Mr. M.) he has consulted with, and taken the practical opinions of the most skilful and experienced farmers in this part of the kingdom; and having daily communication with them on the spot, he has been able to consolidate and combine in his publication every thing that is requisite for the purposes for which it has been prepared. It will be found a most invaluable work."

The farmers are now too enlightened to prefer confusion to order—or darkness to light. The importance of having correct accounts is daily becoming more manifest; difficulty and ruin have marked the course of disorder, whilst prosperity has often been the result of having kept good accounts.

The Right Honourable Sir John Sinclair, Bart., Founder of the Board, and Author of the Code of Agriculture, speaking of regular farming accounts, observes, "That not only memorandum books for the transactions of the day, but that account books ought to be published, properly arranged and divided into columns, containing every thing which experience in the business of farming may suggest." This work is now sent forth, and the publisher trusts it will prove of the greatest utility to the English Farmer. Among other things, Sir John recommends, "that the expences laid out on the farm be kept and attended to by every prudent and industrious occupier. The Dutch wisely inculcate, 'That no one is ever ruined who keeps good accounts.' The advantage to be gained from regular accounts cannot be doubted; by examining them, a farmer is enabled to ascertain the nature and extent of the expense he has incurred in the various operations of agriculture, and to discover what particular measures or systems contribute to profit or occasion loss. The principle of economy may be then introduced," &c.

The rapid sale of twenty-five editions of this work, together with the high praises it has met with, must convince the public of its utility; it is recommended by agriculturists of celebrity, who have used it with great satisfaction and advantage, and who find it well calculated to remove those difficulties which, from the variety of their concerns, are so generally experienced.

The publisher recommends the above work to Agriculturists in general, as being the most simple and practical mode of keeping Farming Accounts, hitherto offered to the Public. It will recommend itself to the intelligent farmer by its convenience; and any person acquainted with the rudiments of Arithmetic, by attending to the directions in this work, may keep his accounts in a systematic manner.

New Editions of the following Works may still be purchased at the Publishers.

BAXTER'S PARISH ACCOUNT BOOKS.
——— OVERSEERS and PAUPER'S LEDGER, which book will be found to be of the greatest value, to all Parishes, 2*l.* 2*s.*
——— WEEKLY PAY LIST, 1*l.* 12*s.*
——— GENERAL VESTRY BOOK, 1l. 12*s.*
——— OVERSEER'S COLLECTING BOOK, 7*s.* 6*d.*
——— PARISH LEDGER, &c. &c.
——— SURVEYOR'S ACCOUNT BOOKS.
——— MARKET BOOKS.

New Edition of the HISTORY OF LEWES, 2 vols., 4to. will shortly be published, under the Patronage of His Majesty.

The high character which the first Edition of this Work received, from the various Reviews, and the general support with which has been countenanced by the enlightened reader, has induced the publisher to print a second Edition.

For J. BAXTER'S other publications, see his Catalogue.

General Book and Stationary Warehouse,
37, *High Street*

On Converting tillage land to permanent pastures, and renovating inferior and unproductive meadows.

At the late meeting of the Bath and West of England Agricultural Society, there was exhibited from CORMACK, SON and SINCLAIR'S, Nurserymen, Seedsmen, and Florists, Bedford Conservatories, Covent Garden, and New Cross, London, seeds of the different grasses which constitute the produce of the richest permanent pastures, or of those most celebrated for fattening, and for dairy produce. The number of the different grasses was fourteen exclusive of clovers. It was stated by Mr. George Sinclair, author of the Hortus Gramineus Woburnensis, that the fact of tillage land being converted to permanent pasture of the best quality for productiveness, permanency, and nutritive powers, in the short space of two seasons, had now been proved beyond doubt on almost every variety of soil. Within his own personal knowledge there had been upwards of two thousand three hundred acres of land, of various qualities, in England, Scotland, and Ireland, converted to permanent pasture with the seeds of these grasses, and in every instance affording the most satisfactory results. It was therefore now, within the power of the Agriculturist to convert fallow land to permanent pasture, in quality equal to ancient meadow land, according to the soil, in the course of one or two seasons; but that it was essential the seeds used should be genuine and free from admixture of spurious grasses, the land clean and in good heart, the different species combined in such proportions as was best adapted to the peculiar variety of soil, and that a sufficiency of the seeds, to stock at once the surface of the land, should be used. By these means the forming of rich meadow, or pasture, is effected in the short space of time already mentioned. Degenerated meadows, as well as unproductive pastures may be renovated without breaking up the old sward, by their being harrowed or scarified, and then applying a top dressing to receive the seeds of the different species adapted to the peculiar nature of the soil.

It may be asked, why are more than one, or so many different species of grass required to form a pasture, similar in properties to that of a rich ancient meadow? The reason would be evident, when it was found (and which would be found by any one who would observe the growth of the grasses for one season) that each distinct species of grass has its own peculiar season of being in perfection of growth; and that not a month, from April to November, occurs, but which has one or more distinct species of grass in a greater perfection of growth, than at any other time during the year. Hence, when only one or two species of grasses are sown in a pasture, there may be said to be only one crop in the year; but when those species are combined, which come in perfection successively every month, from spring to winter, a succession of rich herbage is kept up throughout the season, and makes the distinction so well known, between artificial pastures, formed of rye grass and clover only, and rich natural pastures, constituted of from twelve to eighteen different grasses and clovers. In instances (and they are numerous) where from neglect of stagnant moisture (though the soil be rich in vegetable matter,) the herbage has become coarse and unprofitable, it is found a valuable practice to pare and burn the surface, and, after proper draining, to take a course of alternate crops of corn and green food. The riches of the soil are thus brought into activity, and a valuable produce obtained, previous to returning the land to improved permanent pasture of the richest quality. Whatever benefit had accrued to the interests of this branch of practical husbandry, the country was indebted for the same to the illustrious nobleman (the Duke of Bedford,) who instituted the experiments which led to the practice now alluded to, and which have in every instance been followed with success.

ADDENDA ET CORRIGENDA.

In Preface (omission) Charles Craven, Esq., Contributor.

PAGE.	LINE.		
63	2	From the	bottom for, March read Marsh.
79	26	——	top for, Decandria, &c., to 10 dele, &c., to.
111	3	——	top for, Digymia read Digynia.
184	2	——	bottom for, applys in read applies to.
191	18	——	bottom for, half an inch read about a quarter of an inch.
199	6	——	bottom for, 14, 15, read 13, 14.
202	6	——	top for, preceding read succeeding.
206	25	——	top for, Monagynia read Monogynia.
210	24	——	bottom for, Grossulareæ read Grossulaceæ.
261	24	——	bottom for, Humulis read Humulus.
352	12	——	bottom for, Fugi read Fungi.
375	36	——	top for, In stall feeding, cattle, regularity of fattening is read in stall feeding, fattening cattle regularity is.
403	24	——	bottom for, Solanæ read Solaneæ.
428	23	——	top for, Rhyum Enneandria Trigenia read Rheum Enneandria Trigynia.
431	3	——	bottom for, tenantry read tenancy.
432	7	——	top, after broad-shared insert fifth year oats.
432	9	——	top for, turned all over read limed all over.
432	30	——	top for, the occasional read an occasional.
432	31	——	bottom for, unless read though on the contra y if.
436	13	——	bottom for, Mongynia Linn. and Ructaceæ read Monogynia Linn. and Rutaceæ.
437	8	——	top for, Dyginia read Digynia.
456	10	——	top for, the ewes read the greater part of the ewes.
456	27	——	top, after their young, insert in five or six days after lambing however it will be necessary to keep them somewhat better.
457	5	——	top for seed read swedes.
459	21	——	top for, on the surface read dislodged from the surface.
460	24	——	top for, lamb read sheep.
461	5	——	bottom for, sheep read lambs.
473	27	——	top for, four in read four hogs in.
474	21	——	bottom for, Luguminoseæ read Leguminosæ.

[ENTERED AT STATIONERS'-HALL.]